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Report of the 101st National Conference on Weights and Measures

as adopted by the 101st
National Conference on Weights and Measures
2016

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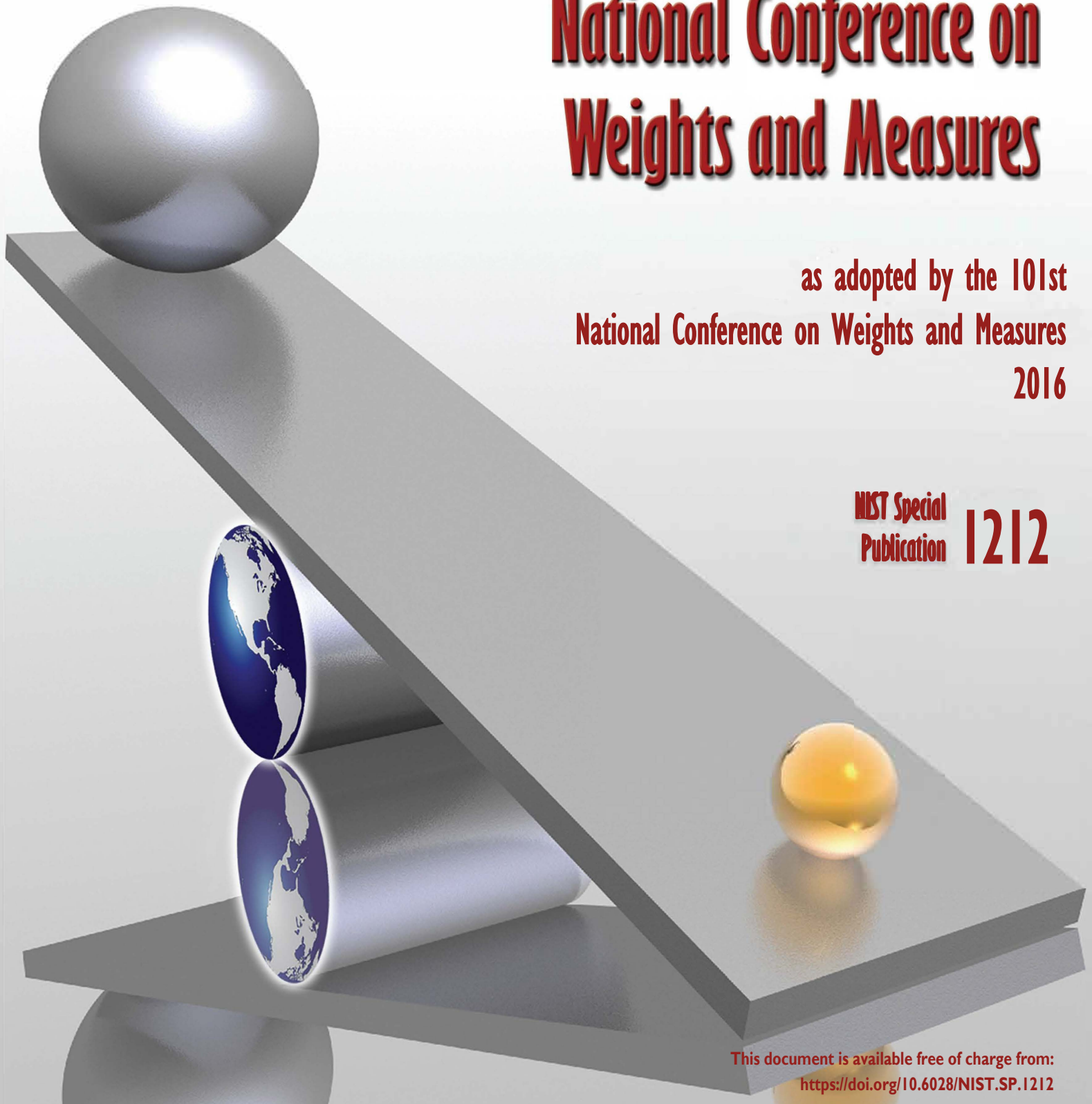

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Report of the 101st National Conference on Weights and Measures

Denver, Colorado – July 24 through 28, 2016
as adopted by the 101st National Conference on Weights and Measures 2016

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June 2017

U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
Kent Rochford, Acting NIST Director and Under Secretary of Commerce for Standards and Technology

The National Conference on Weights and Measures is supported by the National Institute of Standards and Technology and is attended by officials from various states, counties, and cities, as well as representatives from the U.S. Government, other nations, industry, and consumer organizations.

Abstract

The 101st Annual Meeting of the National Conference on Weights and Measures (NCWM) was held July 24 - 28, 2016, at Grand Hyatt Denver Hotel, Denver, Colorado. The theme of the meeting was "NCWM – Strengthening a Progressive Organization."

Reports by the NCWM Board of Directors, Standing Committees, and Special Purpose Committees constitute the major portion of this publication, along with the addresses delivered by Conference officials and other authorities from government and industry.

Special meetings included those of the Meter Manufacturers Association, Packaging and Labeling Subcommittee, Fuels and Lubricants Subcommittee, Associate Membership Committee, Regional Association Meetings, Multipoint Calibration Task Group and the Weigh-in-Motion Task Group.

Key words: laws and regulations; legal metrology; meters; scales; specifications and tolerances; training; type evaluation; uniform laws; weights and measures.

Note: The policy of the National Institute of Standards and Technology is to use metric units of measurement in all its publications. In this publication, however, recommendations received by the NCWM technical committees have been printed as they were submitted, and, therefore, may contain references to U.S. Customary Units where such units are commonly used in industry practice. Opinions expressed in non-NIST papers are those of the authors and not necessarily those of the National Institute of Standards and Technology. Non-NIST speakers are solely responsible for the content and quality of their material.

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WASHINGTON: 2017

National Conference on Weights and Measures

Annual Report of the 101st NCWM

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Past Chairmen of the Conference

Conference	Year	Location	Chairman
1st	1905	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
2nd	1906	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
3rd	1907	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
4th	1908	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
	1909	Conference Was Not Held	
5th	1910	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
6th	1911	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
7th	1912	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
8th	1913	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
9th	1914	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
10th	1915	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
11th	1916	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
	1917	Conference Was Not Held	
	1918	Conference Was Not Held	
12th	1919	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
13th	1920	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
14th	1921	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
15th	1922	Washington, D.C.	Dr. S.W. Stratton, Bureau of Standards
16th	1923	Washington, D.C.	Dr. George Burgess, Bureau of Standards
17th	1924	Washington, D.C.	Dr. George Burgess, Bureau of Standards
18th	1925	Washington, D.C.	Dr. George Burgess, Bureau of Standards
19th	1926	Washington, D.C.	Dr. George Burgess, Bureau of Standards
20th	1927	Washington, D.C.	Dr. George Burgess, Bureau of Standards
21st	1928	Washington, D.C.	Dr. George Burgess, Bureau of Standards
22nd	1929	Washington, D.C.	Dr. George Burgess, Bureau of Standards
23rd	1930	Washington, D.C.	Dr. George Burgess, Bureau of Standards
24th	1931	Washington, D.C.	Dr. George Burgess, Bureau of Standards
	1932	Conference Was Not Held	
	1933	Conference Was Not Held	
	1934	Conference Was Not Held	
25th	1935	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
26th	1936	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
27th	1937	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
28th	1938	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
29th	1939	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards

Conference	Year	Location	Chairman
30th	1940	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
31st	1941	Washington, D.C.	Dr. Lyman Briggs, National Bureau of Standards
	1942	Conference Was Not Held	
	1943	Conference Was Not Held	
	1944	Conference Was Not Held	
	1945	Conference Was Not Held	
32nd	1946	Washington, D.C.	Dr. E.U. Condon, National Bureau of Standards
33rd	1947	Washington, D.C.	Dr. E.U. Condon, National Bureau of Standards
	1948	Conference Was Not Held	
34th	1949	Washington, D.C.	Dr. E.U. Condon, National Bureau of Standards
35th	1950	Washington, D.C.	Dr. E.U. Condon, National Bureau of Standards
36th	1951	Washington, D.C.	Dr. E.U. Condon, National Bureau of Standards
37th	1952	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
38th	1953	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
39th	1954	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
40th	1955	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
41st	1956	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
42nd	1957	Washington, D.C.	Dr. A.V. Astin, National Bureau of Standards
43rd	1958	Washington, D.C.	J.P. McBride, MA
44th	1959	Washington, D.C.	C.M. Fuller, CA
45th	1960	Washington, D.C.	H.E. Crawford, FL
46th	1961	Washington, D.C.	R.E. Meek, IN
47th	1962	Washington, D.C.	Robert Williams, NY
48th	1963	Washington, D.C.	C.H. Stender, SC
49th	1964	Washington, D.C.	D.M. Turnbull, WA
50th	1965	Washington, D.C	V.D. Campbell, OH
51st	1966	Denver, CO	J.F. True, KS
52nd	1967	Washington, D.C.	J.E. Bowen, MA
53rd	1968	Washington, D.C.	C.C. Morgan, IN
54th	1969	Washington, D.C.	S.H. Christie, NJ
55th	1970	Salt Lake City, UT	R.W. Searles, OH
56th	1971	Washington, D.C.	M. Jennings, TN
57th	1972	Washington, D.C.	E.H. Black, CA
58th	1973	Minneapolis, MN	George Johnson, KY
59th	1974	Washington, D.C.	John Lewis, WA
60th	1975	San Diego, CA	Sydney Andrews, FL
61st	1976	Washington, D.C.	Richard Thompson, MD
62nd	1977	Dallas, TX	Earl Prideaux, CO

Conference	Year	Location	Chairman
63rd	1978	Washington, D.C.	James Lyles, VA
64th	1979	Portland, OR	Kendrick Simila, OR
65th	1980	Washington, D.C.	Charles Vincent, TX
66th	1981	St. Louis, MO	Edward Stadolnik, MA
67th	1982	Atlanta, GA	Edward Heffron, MI
68th	1983	Sacramento, CA	Charles Greene, NM
69th	1984	Boston, MA	Sam Hindsman, AR
70th	1985	Washington, D.C.	Ezio Delfino, CA
71st	1986	Albuquerque, NM	George Mattimoe, HI
72nd	1987	Little Rock, AR	Frank Nagele, MI
73rd	1988	Grand Rapids, MI	Darrell Guensler, CA
74th	1989	Seattle, WA	John Bartfai, NY
75th	1990	Washington, D.C.	Fred Gerk, NM
76th	1991	Philadelphia, PA	N. David Smith, NC
77th	1992	Nashville, TN	Sidney Colbrook, IL
78th	1993	Kansas City, MO	Allan Nelson, CT
79th	1994	San Diego, CA	Thomas Geiler, MA
80th	1995	Portland, ME	James Truex, OH
81st	1996	New Orleans, LA	Charles Gardner, NY
82nd	1997	Chicago, IL	Barbara Bloch, CA
83rd	1998	Portland, OR	Steven Malone, NE
84th	1999	Burlington, VT	Aves Thompson, AK
85th	2000	Richmond, VA	Wes Diggs, VA
86th	2001	Washington, D.C.	Louis Straub, MD
87th	2002	Cincinnati, OH	Ronald Murdock, NC
88th	2003	Sparks, NV	Ross Andersen, NY
89th	2004	Pittsburgh, PA	Dennis Ehrhart, AZ
90th	2005	Orlando, FL	Wes Diggs, VA
91st	2006	Chicago, IL	Don Onwiler, NE
92nd	2007	Salt Lake City, UT	Michael Cleary, CA
93rd	2008	Burlington, VT	Judy Cardin, WI
94th	2009	San Antonio, TX	Jack Kane, MT
95th	2010	St. Paul, MN	Randy Jennings, TN
96th	2011	Missoula, MT	Tim Tyson, KS
97th	2012	Portland, ME	Kurt Floren, CA
98th	2013	Louisville, KY	Stephen Benjamin, NC
99th	2014	Detroit, MI	John Gaccione, NY
100th	2015	Philadelphia, PA	Ronald Hayes, MO

Conference	Year	Location	Chairman
101st	2016	Denver, CO	Jerry Buendel, WA

2015 - 2016 Organizational Chart

National Conference on Weights and Measures (NCWM) Board of Directors			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Chairman	Jerry Buendel	Washington	2016
Chairman-Elect	Kristin Macey	California	2016
Immediate Past Chair	Ronald Hayes	Missouri	2016
Treasurer	Raymond Johnson	New Mexico	2016
Active Membership – Western	Brett Gurney	Utah	2017
Active Membership – Southern	Kenneth Ramsburg	Maryland	2018
Active Membership – Northeastern	James Cassidy	City of Cambridge, Massachusetts	2019
Active Membership – Central	Craig VanBuren	Michigan	2020
At-Large	Chuck Corr	Archer Daniels Midland Company	2018
At-Large	Steve Giguere	Maine	2016
Associate Membership	Christopher Guay	Procter and Gamble, Co.	2016
Honorary NCWM President	Dr. Willie May	NIST Director	NA
Executive Director	Don Onwiler	NCWM	NA
Executive Secretary	Georgia Harris	Acting Chief, NIST, Office of Weights and Measures	NA
NTEP Administrator	Jim Truex	NCWM	NA
Measurement Canada Advisor	Carl Cotton	Measurement Canada	NA

National Type Evaluation Program Committee (NTEP)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Ronald Hayes	Missouri	2016
Member	Jerry Buendel	Washington	2017
Member	Kristin Macey	California	2018
Member	Kenneth Ramsburg	Maryland	2018
Member	James Cassidy	Massachusetts	2019
NTEP Administrator	Jim Truex	NCWM	NA

Finance Committee			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Kristin Macey	California	2016
Nominated Chair-Elect	James Cassidy	City of Cambridge, Massachusetts	2017
Member	Raymond Johnson	New Mexico	2016
Member	Christopher Guay	Procter and Gamble, Co.	2016
Executive Director	Don Onwiler	NCWM	NA

Laws and Regulations Committee (L&R)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Richard Lewis	Georgia	2016
Member	Louis Sakin	Towns of Hopkinton/Northbridge, Massachusetts	2017
Member	John Albert	Missouri	2018
Member	Michelle Wilson	Arizona	2019
Member	Ethan Bogren	Westchester County, New York	2020
Associate Membership Representative	Rebecca Richardson	MARC – IV Consulting	2018
Canadian Technical Advisor	Lance Robertson	Measurement Canada	NA
NIST Technical Advisor	David Sefcik	NIST, Office of Weights and Measures	NA
NIST Technical Advisor	Lisa Warfield	NIST, Office of Weights and Measures	NA

Professional Development Committee (PDC)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Angela Godwin	Ventura County, California	2016
Member	Stacy Carlsen	Marin County, California	2017
Member	Julie Quinn	Minnesota	2018
Member	Doug Killingsworth	Georgia	2019
Member	Cheryl Ayer	New Hampshire	2020
Associate Membership Representative	Richard Shipman	Rice Lake Weighing Systems, Inc.	2018
Safety Liaison	TBD		NA

Professional Development Committee (PDC)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
NIST Liaison	Tina Butcher	NIST, Office of Weights and Measures	NA
Certification Coordinator	Ross Andersen	Retired	NA

Specifications and Tolerances Committee (S&T)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Mahesh Albuquerque	Colorado	2016
Member	Jane Zulkiewicz	Town of Barnstable, Massachusetts	2017
Member	Matthew Curran	Florida	2018
Member	Ivan Hankins	Iowa	2019
Member	Rachelle Miller	Wisconsin	2020
Canadian Technical Advisor	Luciano Burtini	Measurement Canada	NA
NIST Technical Advisor	TBD	NIST, Office of Weights and Measures	NA
NIST Technical Advisor	Rick Harshman	NIST, Office of Weights and Measures	NA
NTEP Technical Advisor	Darrell Flocken	NCWM	NA
Committee Chair	Mahesh Albuquerque	Colorado	2016

Nominating Committee			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Ronald Hayes	Missouri	2016
Member	John Gaccione	Westchester County, New York	2016
Member	Stephen Benjamin	North Carolina	2016
Member	Kurt Floren	Los Angeles County, California	2016
Member	Randy Jennings	Tennessee	2016
Member	Joe Gomez	New Mexico	2016
Member	Charles Carroll	Massachusetts	2016

Credentials Committee			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Fran Elson-Houston	Ohio	2016
Member	Matt Maiten	Santa Barbara County, California	2017
Member	Lori Jacobson	South Dakota	2018
Coordinator	Darrell Flocken	NCWM	NA

Appointive Officials			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Parliamentarian	Louis Straub	Fairbanks Scale, Inc.	2016
Presiding Officer	Laurence Nolan	Los Angeles County, California	2016
Presiding Officer	Jack Walsh	Town of Wellesley, Massachusetts	2016
Presiding Officer	Tim Chesser	Arkansas	2016
Presiding Officer	Steve Harrington	Oregon	2016
Sergeant-at-Arms	Rich Holcomb	Colorado Division of Oil and Public Safety	2016
Sergeant-at-Arms	Alberto Villagomez	Colorado Division of Oil and Public Safety	2016
Sergeant-at-Arms	Scott Wagner	Colorado Division of Oil and Public Safety	2016

Associate Membership Committee			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	David Calix	NCR Corporation	2016
Vice-Chair	Richard Shipman	Rice Lake Weighing Systems, Inc.	2016
Secretary/Treasurer	Bill Callaway	Crompco	2016
Member	David Calix	NCR Corporation	2018
Member	Bill Callaway	Crompco	2018
Member	Robert Murnane, Jr.	Seraphin Test Measure	2018
Member	Paul A. Lewis, Sr.	Rice Lake Weighing Systems, Inc.	2019
Member	Richard Shipman	Rice Lake Weighing Systems, Inc.	2020
Member	Christopher Guay	Procter and Gamble, Co.	2020

Associate Membership Committee			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Member	Mark Flint	ADM	2020
Member	Rebecca Richardson	MARC – IV Consulting	2020

Fuels and Lubricants Subcommttee		
OFFICE	**NAME**	**AFFILIATION**
Committee Chair	Matthew Curran	Florida
Vice-Chair	Ronald Hayes	Missouri
Vice-Chair	Randy Jennings	Tennessee
Secretary	Kevin Ferrick	American Petroleum Institute
Vice-Secretary	Rebecca Richardson	MARC – IV Consulting
NIST Technical Advisor	David Sefcik	NIST, Office of Weights and Measures
NIST Technical Advisor	Lisa Warfield	NIST, Office of Weights and Measures
Advisory Member	Curtis Williams	Retired
Public Sector Member	Mahesh Albuquerque	Colorado
Public Sector Member	Stephen Benjamin	North Carolina
Public Sector Member	Tim Elliot	Washington
Public Sector Member	Kristin Macey	California
Public Sector Member	Doug Rathbun	Illinois
Public Sector Member	Bill Striejewske	Nevada
Public Sector Member	Timothy White	Michigan
Public Sector Member	Michelle Wilson	Arizona
Private Sector Member	Holly Alfano	Independent Lubricant Manufacturers Association
Private Sector Member	Matt Bjornson	Bjornson Oil Company
Private Sector Member	Bill Cannella	Chevron Global Downstream, LLC
Private Sector Member	Chuck Corr	Archer Daniels Midland Company
Private Sector Member	Davis Cosey	Davis Oil Company
Private Sector Member	Kelly Davis	Renewable Fuels Association
Private Sector Member	Dayne Delahoussaye	Neste Oil
Private Sector Member	Stan Dempsey	Colorado Petroleum Association

Fuels and Lubricants Subcommttee		
OFFICE	**NAME**	**AFFILIATION**
Private Sector Member	Ed Dougherty	Sunoco, Inc.
Private Sector Member	David Fialkov	NATSO
Private Sector Member	Rick Fragnito	Shell
Private Sector Member	Philip Guillemette	Flint Hills Resources, LP
Private Sector Member	John Harkins	Sunoco, Inc.
Private Sector Member	Marilyn Herman	Herman and Associates
Private Sector Member	Joanna Johnson	Automotive Oil Exchange Association
Private Sector Member	Patrick Kelly	American Petroleum Institute
Private Sector Member	Brian Kernke	Love's Travel Stops
Private Sector Member	Stephen Kirby	General Motors
Private Sector Member	David A. Kovach	BP Products
Private Sector Member	Mike Kunselman	Center for Quality Assurance
Private Sector Member	Jeffrey Leiter	Bassman, Mitchell, Alfano & Leiter Chtd.
Private Sector Member	Russ Lewis	Marathon Petroleum, LLC
Private Sector Member	Michael Lynch	ExxonMobil Corporation
Private Sector Member	Scott Mason	Phillips 66
Private Sector Member	James McGetrick	BP Products
Private Sector Member	Kristi Moore	KMoore Consulting, LLC
Private Sector Member	Manuch Nikanjam	Chevron Global Downstream, LLC
Private Sector Member	Brian Parnell	Mapco Express
Private Sector Member	Keith Penn	Colonial Pipeline Company
Private Sector Member	Derek Regal	Tesoro Companies, Inc.
Private Sector Member	Prentiss Searles	American Petroleum Institute
Private Sector Member	Jenny Sigelko	Volkswagen Group of America
Private Sector Member	Brad Stotler	NATSO
Private Sector Member	William Studzinski	General Motors – Powertrain Division
Private Sector Member	Rob Underwood	Petroleum Marketers Association of America
Private Sector Member	Marie Valentine	Toyota -TEMA -TTC
Private Sector Member	Steve Vander Griend	ICM, Inc.

Packaging and Labeling Subcommittee		
OFFICE	**NAME**	**AFFILIATION**
Committee Chair	Christopher Guay	Procter and Gamble, Co.
NIST Technical Advisor	David Sefcik	NIST, Office of Weights and Measures
Public Sector – Central	Nicholas Owens	Stark County Weights and Measures, Ohio
Public Sector – Northeastern	Frank Greene	Connecticut
Public Sector – Southern	Hal Prince	Florida
Public Sector – Western	Angela Godwin	County of Ventura, California
Private Sector Member	Ann Boeckman	Kraft Food Group, Inc.
Private Sector Member	Krister Hard af Segerstad	IKEA North America Services, LLC
Private Sector Member	Zina Juroch	Pier 1 Imports

Natural Gas Steering Committee		
OFFICE	**NAME**	**AFFILIATION**
Committee Chair	Ethan Bogren	Westchester County, New York
Vice-Chair	Raymond Johnson	New Mexico
NIST Technical Advisor	Juana Williams	NIST, Office of Weights and Measures
Public Sector – Central	Ronald Hayes	Missouri
Public Sector – Southern	Matthew Curran	Florida
Public Sector – Western	Mahesh Albuquerque	Colorado
Public Sector Member	G. Diane Lee	NIST, Office of Weights and Measures
Private Sector Member	Jeffrey L. Clarke	NGV America
Private Sector Member	Gordon Johnson	Gilbarco, Inc.
Private Sector Member	Dmitri Karimov	Liquid Controls, LLC
Private Sector Member	Randy Moses	Wayne Fueling Systems
Private Sector Member	Prentiss Searles	American Petroleum Institute

Promotional Tool Kit Task Group		
OFFICE	**NAME**	**AFFILIATION**
Chair	Stephen Benjamin	North Carolina
Public Sector Member	Jerry Buendel	Washington
Public Sector Member	Kurt Floren	Los Angeles County, California
Private Sector Member	Bill Callaway	Crompco
Private Sector Member	John Hughes	Rice Lake Weighing Systems, Inc.

Organometallics Task Group		
OFFICE	**NAME**	**AFFILIATION**
Chair	Randy Jennings	Tennessee
Public Sector Member	Ronald Hayes	Missouri
Public Sector Member	Bill Striejewske	Nevada
Private Sector Member	Marilyn Herman	Herman and Associates
Private Sector Member	Jeff Jetter	Honda R&D Americas, Inc.
Private Sector Member	Russ Lewis	Marathon Petroleum
Private Sector Member	James McGetrick	BP Products
Private Sector Member	Kristy Moore	Renewable Fuels Foundation
Private Sector Member	Derek Regal	Tesoro Chemical
Private Sector Member	Jenny Sigelko	Volkswagen Group of America
Private Sector Member	Val Ughetta	Alliance of Automobile Manufacturers

Meat, Poultry, Fish and Seafood Method of Sale Task Group		
OFFICE	**NAME**	**AFFILIATION**
Co-Chair	David Sefcik	NIST, Office of Weights and Measures
Co-Chair	Lisa Warfield	NIST, Office of Weights and Measures
Public Sector Member	Stephen Benjamin	North Carolina
Public Sector Member	Charles Carroll	Massachusetts
Public Sector Member	Fran Elson-Houston	Ohio
Public Sector Member	Kurt Floren	Los Angeles County, California

Meat, Poultry, Fish and Seafood Method of Sale Task Group		
OFFICE	**NAME**	**AFFILIATION**
Public Sector Member	Roger Frazier	Arkansas
Public Sector Member	Jason Glass	Kentucky
Public Sector Member	Brett Gurney	Utah
Public Sector Member	Milton Hargrave	Virginia
Public Sector Member	Ryanne Hartman	Michigan
Public Sector Member	Lori Jacobson	South Dakota
Public Sector Member	Hal Prince	Florida
Public Sector Member	Louis Sakin	Towns of Hopkinton/Northbridge, Massachusetts
Public Sector Member*	Ken Tichota	Nebraska
Public Sector Member	Philip Wright	Texas
Private Sector Member	Dave Davis	Utah Food Industry Association
Private Sector Member	Linda Doherty	New Jersey Food Council
Private Sector Member	Eric Hardin	The Fresh Market, Inc.
Private Sector Member	Vincent Orr	Whole Foods Market
Private Sector Member	Audrey Patterson	King Williams and Gleason LLP
Private Sector Member	Michael Roberson	Publix Supermarkets
Private Sector Member	Kevin Schneider	Giant Food
Private Sector Member	Elizabeth Tansing	Food Marketing Institute

Weigh-In-Motion Task Group		
Office	**Name**	**Affiliation**
Chair	Alan Walker	Florida
NTEP Technical Advisor	Darrell Flocken	NCWM
NIST Technical Advisor	Rick Harshman	NIST, Office of Weights and Measures
Public Sector Member	Tim Chesser	Arkansas
Public Sector Member	Randy Coplin	Michigan State Police
Public Sector Member	Lenny Goebel	Illinois
Private Sector Member	Jon Arnold	Intercomp Company
Private Sector Member	Tim Broemmer	Rice Lake Weighing Systems, Inc.

Weigh-In-Motion Task Group		
Office	**Name**	**Affiliation**
Private Sector Member	Brad Fryburger	Rinstrum, Inc.
Private Sector Member	Joe Grell	Rice Lake Weighing Systems, Inc.
Private Sector Member	Randy Hanson	International Road Dynamics
Private Sector Member	Tom Kearney	USDOT - FHWA
Private Sector Member	John Lawn	Rinstrum, Inc.
Private Sector Member	Louis Straub	Fairbanks Scale, Inc.
Private Sector Member	Richard Suiter	Richard Suiter Consulting
Private Sector Member	Brian Taylor	Intelligent Imagining Systems
Private Sector Member	Russ Vires	Mettler-Toledo, LLC
Private Sector Member	Matt Young	Intercomp Company

Multiple Dimension Measuring Device Work Group		
OFFICE	**NAME**	**AFFILIATION**
Chair	Robert Kennington	Quantronix, Inc.
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Technical Advisor	Rick Harshman	NIST, Office of Weights and Measures
Public Sector Member	Tom Buck	Ohio
Public Sector Member	Fran Elson-Houston	Ohio
Public Sector Member	Justin Rae	Measurement Canada
Public Sector Member	Isabelle Tremblay	Measurement Canada
Public Sector Member	Pascal Turgeon	Measurement Canada, Policy/Regulations Group
Private Sector Member	Sprague Ackley	Honeywell
Private Sector Member	Scott Davidson	Mettler-Toledo, LLC
Private Sector Member	Michael Eichenberg	FreightSnap, LLC
Private Sector Member	Justin Harper	AOA Xinetics/NGC
Private Sector Member	Scott Henry	Zebra Technologies
Private Sector Member	Uwe Mohr	Vitronic
Private Sector Member	Scott Murchison	Zebra Technologies

Multiple Dimension Measuring Device Work Group		
OFFICE	**NAME**	**AFFILIATION**
Private Sector Member	Don Newell	National Motor Freight Traffic Association
Private Sector Member	Jack Pangrazio	LTS Scale Company, LLC
Private Sector Member	Tony Romeo	Datalogic
Private Sector Member	Clay Scofield	AAA Cooper Transportation
Private Sector Member	Christopher Senneff	Rice Lake Weighing Systems, Inc.
Private Sector Member	Richard Shipman	Rice Lake Weighing Systems, Inc.
Private Sector Member	Mike Stutler	United Parcel Service
Private Sector Member	Richard Suiter	Richard Suiter Consulting
Private Sector Member	Russ Vires	Mettler-Toledo, LLC
Private Sector Member	Scott Wigginton	United Parcel Service

NTEP Belt-Conveyor Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Peter Sirrico	Thayer Scale/Hyer Industries
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Technical Advisor	John Barton	NIST, Office of Weights and Measures
Public Sector Member	Tina Butcher	NIST, Office of Weights and Measures
Public Sector Member	Zacharias Tripoulas	Maryland
Public Sector Member	Thomas Vormittag	Nevada
Private Sector Member	Rafael Jimenez	Association of American Railroads Transportation Technology Center, Inc.
Private Sector Member	Jason Kukachka	Thermo Fisher Scientific

NTEP Grain Analyzer Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Karl Cunningham	Illinois
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Technical Advisor	G. Diane Lee	NIST, Office of Weights and Measures
Advisory Member	Cassie Eigenmann	Retired
Public Sector Member	Randy Burns	Arkansas
Public Sector Member	Tina Butcher	NIST, Office of Weights and Measures
Public Sector Member	Ivan Hankins	Iowa
Public Sector Member	Thomas Hughes	Missouri
Public Sector Member	Jason Jordan	USDA, GIPSA, Technical Services Division
Private Sector Member	Jeffrey Adkisson	Grain and Feed Association of Illinois
Private Sector Member	Rachel Beiswenger	TSI Incorporated
Private Sector Member	Martin Clements	The Steinlite Corporation
Private Sector Member	Kathy Conover	DICKEY-john Corporation
Private Sector Member	Andrew Gell	Foss North America
Private Sector Member	Charles Hurburgh, Jr.	Iowa State University
Private Sector Member	Jess McCluer	National Grain and Feed Association
Private Sector Member	Thomas Runyon	Seedburo Equipment Co.

NTEP Measuring Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Michael Keilty	Endress + Hauser Flowtec AG, USA
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Technical Advisor	Clark Cooney	California Division of Measurement Standards
Public Sector Member	Luciano Burtini	Measurement Canada

NTEP Measuring Sector		
OFFICE	**NAME**	**AFFILIATION**
Public Sector Member	Tina Butcher	NIST, Office of Weights and Measures
Public Sector Member	Joe Eccleston	Maryland
Public Sector Member	Allen Katalinic	North Carolina
Public Sector Member	John Roach	California
Private Sector Member	Steve Bar	Bennett Pump Company
Private Sector Member	Marc Buttler	Emerson Process Management / Micro Motion
Private Sector Member	William Cooper	Tuthill Transfer Systems
Private Sector Member	Constantine Cotsoradis	Flint Hills Resources
Private Sector Member	Ronnell Gallon	Zenner Performance Meters, Inc.
Private Sector Member	Paul Glowacki	Murray Equipment, Inc.
Private Sector Member	Gordon Johnson	Gilbarco, Inc.
Private Sector Member	Dmitri Karimov	Liquid Controls, LLC
Private Sector Member	Yefim Katselnik	Wayne Fueling Systems
Private Sector Member	Peter Kucmas	KROHNE
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	Randy Moses	Wayne Fueling Systems
Private Sector Member	Donald Mundorff	Badger Meter Scottsdale
Private Sector Member	Andre Noel	Neptune Technology Group, Inc.
Private Sector Member	Christopher (Adam) Oldham	Gilbarco, Inc.
Private Sector Member	Johnny Parrish	Brodie International
Private Sector Member	Richard Tucker	RL Tucker Consulting, LLC

NTEP Software Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	James Pettinato	FMC Technologies Measurement Solutions, Inc.
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Secretary	Teri Gulke	Liquid Controls, LLC
Technical Advisor	Doug Bliss	Mettler-Toledo, LLC
Public Sector Member	Andrei Brezoica	California
Public Sector Member	Tom Buck	Ohio
Public Sector Member	Luciano Burtini	Measurement Canada
Public Sector Member	Joe Eccleston	Maryland
Public Sector Member	Eric Morabito	New York
Public Sector Member	Edward Payne	Maryland
Public Sector Member	John Roach	California
Public Sector Member	Ambler Thompson	NIST, Office of Weights and Measures
Public Sector Member	Zacharias Tripoulas	Maryland
Private Sector Member	Mary Abens	Emerson Process Management
Private Sector Member	John Atwood	Tyson Foods
Private Sector Member	Gary Benjamin	NCR Corporation
Private Sector Member	Benjamin Bertz	Red Seal Measurement
Private Sector Member	Kevin Detert	Avery Weigh-Tronix
Private Sector Member	Andre Elle	Endress + Hauser Flowtec AG
Private Sector Member	Andrew Gell	Foss North America
Private Sector Member	Keith Harper	Gencor Industries, Inc.
Private Sector Member	Tony Herrin	Cardinal Scale Manufacturing, Co.
Private Sector Member	Paul A. Lewis, Sr.	Rice Lake Weighing Systems, Inc.
Private Sector Member	Dominic Meyer	KSi Conveyors, Inc.
Private Sector Member	Richard Miller	FMC Technologies Measurement Solutions, Inc.
Private Sector Member	Christopher (Adam) Oldham	Gilbarco, Inc.
Private Sector Member	Mike Roach	VeriFone
Private Sector Member	Robin Sax	CompuWeigh Corporation

NTEP Software Sector		
OFFICE	**NAME**	**AFFILIATION**
Private Sector Member	David Vande Berg	Vande Berg Scales
Private Sector Member	John Wind	Bizerba USA, Inc.
Private Sector Member	Kraig Wooddell	Hobart

NTEP Weighing Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Rob Upright	Vishay Transducers
NTEP Administrator	Jim Truex	NCWM
NTEP Specialist	Darrell Flocken	NCWM
Technical Advisor	Rick Harshman	NIST, Office of Weights and Measures
Advisory Member	Robert Feezor	Retired
Public Sector Member	L. Cary Ainsworth	USDA, GIPSA
Public Sector Member	Tina Butcher	NIST, Office of Weights and Measures
Public Sector Member	Kevin Chesnutwood	NIST, Office of Weights and Measures
Public Sector Member	Fran Elson-Houston	Ohio
Public Sector Member	Nathan Gardner	Oregon
Public Sector Member	Marcus Harwitz	USDA, GIPSA, FGIS
Public Sector Member	Robert Meadows	Kansas
Public Sector Member	Eric Morabito	New York
Public Sector Member	Edward Payne	Maryland
Public Sector Member	Zacharias Tripoulas	Maryland
Public Sector Member	Pascal Turgeon	Measurement Canada
Public Sector Member	Juana Williams	NIST, Office of Weights and Measures
Private Sector Member	Steven Beitzel	Systems Associates, Inc.
Private Sector Member	Dary Blaney	Balances Industrielles Montreal
Private Sector Member	Neil Copley	Thurman Scale Co.
Private Sector Member	Hayden Cornish	Schenck Process
Private Sector Member	Mitchell Eyles	Flintec, Inc.

NTEP Weighing Sector		
OFFICE	**NAME**	**AFFILIATION**
Private Sector Member	Brad Fryburger	Rinstrum, Inc.
Private Sector Member	Eric Golden	Cardinal Scale Manufacturing, Co.
Private Sector Member	Jon Heinlein	Transcell Technology, Inc.
Private Sector Member	Scott Henry	Zebra Technologies
Private Sector Member	Sam Jalahej	Totalcomp, Inc.
Private Sector Member	Rafael Jimenez	Association of American Railroads Transportation Technology Center, Inc.
Private Sector Member	John Lawn	Rinstrum, Inc.
Private Sector Member	Paul A. Lewis, Sr.	Rice Lake Weighing Systems, Inc.
Private Sector Member	L. Edward Luthy	Schenck Process Transport N.A.
Private Sector Member	Louis Straub	Fairbanks Scale, Inc.
Private Sector Member	Russ Vires	Mettler-Toledo, LLC
Private Sector Member	Jerry Wang	A&D Engineering, Inc.
Private Sector Member	Walter Young	Emery Winslow Scale Company

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	Sherry Turvey Kansas Department of Agriculture			(785) 564-6681 sherry.turvey@kda.ks.gov
Annual Meeting	May 22 - 25, 2017			Lincoln, Nebraska
Interim Meeting	October 3 - 5, 2016			St. Charles, Missouri

Northeastern Weights and Measures Association (NEWMA) www.newma.org				
States	Connecticut Maine Massachusetts	New Hampshire New Jersey New York	Pennsylvania Puerto Rico Rhode Island	Vermont
Contact	James Cassidy City of Cambridge Weights and Measures Department			(617) 349-6133 jcassidy@cambridgema.gov
Annual Meeting	May 15 - 18, 2017			Saratoga Springs, New York
Interim Meeting	October 25 - 26, 2016			Portsmouth, New Hampshire

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 U.S. Virgin Islands Virginia West Virginia
Contact	Philip Wright Texas Department of Agriculture			(512) 463-5706 Philip.Wright@TexasAgriculture.gov	
Annual Meeting	October 16 - 19, 2016			Fort Worth, Texas	

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	Jeri Kahana Hawaii Department of Agriculture			(808) 832-0707 Jeri.M.Kahana@hawaii.gov	
Annual Meeting	September 11 - 15, 2016			Honolulu, Hawaii	

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General Session
Proceeding Speeches, Presentations, and Awards

Denver, Colorado

July 24 – 28, 2016

Table A
Table of Contents

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Honorary President's Address
"Ensuring a Fair and Open Marketplace: Strategies for Change"

Denver, Colorado
July 26, 2016

Dr. Willie E. May
Under Secretary of Commerce for Standards and Technology
and Director, National Institute of Standards and Technology (NIST)

Thank you for the warm welcome and for allowing me visit with you today:

- Hello Denver! The Mile-High City, Hub for the Rocky Mountain Region.
    - Established in 1858.
    - Key industries include mining, energy, high tech products.
    - Named "Best Place to Live" by *U.S. News & World Report* in 2016
    - Fastest Growing U.S. City in 2015
    - Number one city for business and careers (*Forbes, 2015)*

- NIST was established in 1901 provide scientific and measurements to industry. Congress "fixes the standards of weights and measures" and uses NIST to defines the values and units of measurement. To learn more about NIST's laboratories, staffing and budget please see the slides "NIST at a Glance," "Need for Measurement Standards in the United States," NIST Laboratory Programs," "NIST Metrology Laboratories," which are provided below. NIST established the National Conference on Weights and Measures (NCWM) in 1905 and our collaborations over the year have provided the U.S. marketplace with uniformity in both laws, regulations and test procedures.

- Talking about the Future:
    - I will retire in January 2017. The next President of the United States will nominate a new NIST Director following his or her inauguration in January.
    - The Office of Weights and Measures (OWM) will welcome Mr. Doug Olson as its new Chief in February 2017.
    - I want to express my sincere appreciation to Ms. Georgia Harris, Acting Chief of OWM for her outstanding leadership of the office during the "Changing of the Guard" between Ms. Carol Hockert's retirement earlier this year and Mr. Olson's arrival early in 2017.

- NIST is one of the leading participants in an international effort to redefine the kilogram so that its mass is more readily reproducible and which moves it from a physical artifact to a natural constant (i.e., relating mass to power using a Watt Balance) NIST researchers are carefully measuring **Planck's constant** so that it can be the cornerstone of a new and improved International System of Units (The SI). This work is described below in detail in the slides "Redefinition of the Kilogram," "Basis for the Redefinition of the Kilogram: Two Approaches" and "Redefining the International System of Units," which includes a photograph of a Watt Balance.

- NIST has become one of the Obama Administration's key players in technology and innovations. Our scientists are working in advancing cybersecurity in addition to technology and measurements in communications and manufacturing. NIST is also developing advanced materials for manufacturers to use in the future to construct everything from automobiles to airplanes and homes. In addition, NIST's work has

expanded over the past few years to include research in the fields bioscience, health, climate assessment, disaster resilience, and forensic science.

- NIST/NCWM Collaboration
    - Training
        - NIST trained more than 740 students this year in the subjects ranging from laboratory metrology, inspection and test procedures for weighing and measuring devices, and package control and price verification in retail stores.
        - A Train-the-Trainer event will be hosted at NIST in 2017.
        - A NIST grant for $100,000 to fund train the trainer events and travel was recently approved.
    - Legal Metrology Standards for alternative powered automobiles:
        - New standards and procedures for testing hydrogen dispensers have been added to NIST Handbook 44. In addition, a new draft code for the meters used to recharge electric cars has been adopted and standards for field testing are under development.
        - A method of sale based on equivalent values for liquefied natural gas has been proposed and debated by the NCWM and now will be considered for adoption at this meeting.
    - A New Handbook for the States
        - NIST has published NIST Handbook 158, "Field Sampling Procedures for Fuel and Motor Oil Quality Testing – A Handbook for Use by Fuel and Oil Quality Regulatory Officials," for use by the states who conduct regulatory inspections in this area with a goal of increasing uniformity in sample collection.
    - Towards the Future: Responding to New Products and Services
        - NIST is working with several states and the NCWM to develop device requirements and other standards to facilitate the commercialization of recreational marijuana.
        - NIST is working with the NCWM and the GPS/APP based transportation sector to develop appropriate standards and test requirements for this transformational technology.
        - In the future, the retail marketplace will include a wide diversity of "fuels" for transportation and the concept of enabling value comparisons and perhaps sales to be made based on energy content should be considered and would be an area of research that NIST could be called on to assist the NCWM with.
    - Some Future Tools and Expanding Legal Metrology Supervision
        - All levels of government are being challenged to increase productivity while operating with fewer resources. NIST is willing to work with the NCWM and states to develop model programs for greater use of random sampling and risk-based inspections as way to improve inspection efficiency and effectiveness.
        - NIST encourages the states to ensure traceability and equity in the marketplace by expanding their inspection programs to include a wider variety of measuring devices (e.g., scales use at point-of-pack, railroad scales, conveyor scales and moisture meters for grain).

In closing, I want acknowledge my sincere appreciation to each of you and to the NCWM for making the U.S. Weights and Measures System work so well that the public takes accurate weights and measures for granted. Finally, I want you to present a challenge to the NCWM. I am sure you agree that the foundation of all knowledge is accurate data. Both NIST and NCWM needs your help in collecting performance and impact data. Let's work together to define a methodology for data collection so that with the right data, we can do the analysis needed to truly PROVE the WORTH of your efforts to our communities and economy.

Thank you and goodbye.

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Honorary President's Address Presentation

President's Address

"Ensuring a Fair and Open Marketplace: Strategies for Change"

July 26, 2016

Dr. Willie E. May

Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

National Institute of Standards and Technology

NIST National Institute of Standards and Technology

Hello Denver !

Denver: The Mile High City Hub for the Rocky Mountain Region

- Established in 1858
- Key industries mining, energy, high tech products
- Named Best Place to Live by *U.S. News & World Report* in 2016
- Fastest growing U.S. city in 2015, according to U.S. Census Bureau
- Number 1 city for business and careers, *Forbes, 2015*

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NIST is part of the Department of Commerce

Penny Pritzker
Secretary of Commerce

Willie E. May

- **Under Secretary and Administrator** — National Oceanic and Atmospheric Administration
- **Under Secretary for International Trade** — International Trade Administration
- **Under Secretary for Industry and Security** — Bureau of Industry and Security
- **Under Secretary for Economic Affairs** — Economic and Statistics Administration
- **Under Secretary for Standards and Technology** — National Institute of Standards and Technology
- **Under Secretary for Intellectual Property and Director** — United States Patent and Trademark Office

NIST Mission:

To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

NIST At-a-Glance

Major Assets, Partnerships, People, Budget

2 Large Research Campuses

Gaithersburg, MD– **62** bldgs. **578** acres
Boulder, CO—**26** bldgs., **208** acres

Partnerships In Every State

60 Manufacturing Extension Centers
10 joint institutes/Centers of Excellence

FY 2016 Appropriations. $964 Million

NIST labs, $**690 M**
Industrial Technology Services, $**155 M**
Construction of Research Facilities, **$119 M**

Additional Resources
~ $120 M from other government agencies
~ $50 M from reimbursable services

People: Employees & Associates

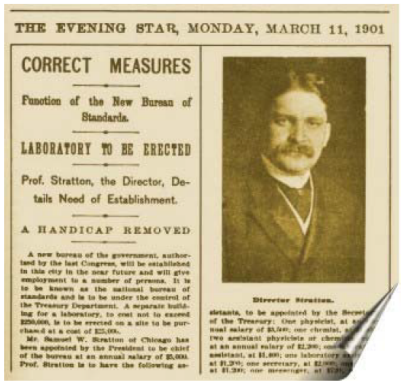
~3,400 Federal Employees
~3,700 Guest Researchers & other NIST Associates
~ 900 foreign Guest Scientists
~400 NIST Staff on **~ 1,000** standards committees

NIST (NBS) established in 1901

"It is therefore the unanimous opinion of your committee that no more essential aid could be given to

- manufacturing
- commerce
- the makers of scientific apparatus
- the scientific work of Government
- schools, colleges, and universities

than by the establishment of the institution proposed in this bill."


THE EVENING STAR, MONDAY, MARCH 11, 1901

CORRECT MEASURES

Function of the New Bureau of Standards.

LABORATORY TO BE ERECTED

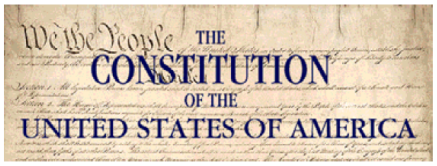
Prof. Stratton, the Director, Details Need of Establishment.

A HANDICAP REMOVED

Director Stratton.

House Committee on Coinage, Weights and Measures ...
May 3, 1900
on the establishment of the
National Bureau of Standards (now NIST)

Need for Measurement Standards in the U.S.



Article I, Section 8: The Congress shall have the power to…*fix the standard of weights and measures*

National Bureau of Standards established by Congress in 1901

- Electrical industry needed standards
- American instruments sent abroad for calibration
- Consumer products and construction materials uneven in quality and unreliable
- Eight different "authoritative" values for the gallon
- 50% of scales, 20% of weights, 50% of dry measures, and 25% of liquid measures were in significant error in favor of the shopkeepers.

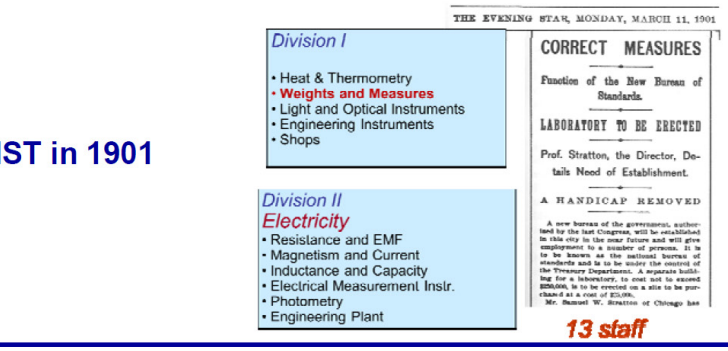
Currently, it is estimated that 80% of global merchandise trade is influenced by testing and other measurement-related requirements of regulations and standards

NIST and NCWM go Way Back!!!!!

NIST in 1901

Division I
- Heat & Thermometry
- **Weights and Measures**
- Light and Optical Instruments
- Engineering Instruments
- Shops

Division II
Electricity
- Resistance and EMF
- Magnetism and Current
- Inductance and Capacity
- Electrical Measurement Instr.
- Photometry
- Engineering Plant


THE EVENING STAR, MONDAY, MARCH 11, 1901

CORRECT MEASURES

Function of the New Bureau of Standards.

LABORATORY TO BE ERECTED

Prof. Stratton, the Director, Details Need of Establishment.

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A new bureau of the government, authorized by the last Congress, will be established in this city in the near future and will give employment to a number of persons. It is to be known as the national bureau of standards and is to be under the control of the Treasury Department. A separate building for a laboratory, to cost not to exceed $250,000, is to be erected on a site to be purchased at a cost of $75,000.

Mr. Samuel W. Stratton of Chicago has

13 staff

Division III
Chemistry
"This section was increasingly involved in its investigation of properties for the Government testing program and produced standard samples of alloys, steels, iron ores, copper slags, cements, and lubricating oil."

White House Reception for the
21st National Conference of Weights and Measures, May 25, 1928

NIST Laboratory Program

- providing measurement solutions for industry and the nation

Standards Coordination Office
Standards Services Division
NIST Quality Manager

Associate Director for Laboratory Programs

Special Programs Office
Law Enforcement Standards, *National Security Standards, and* Climate Assessment activities

- **Material Measurement Laboratory**
- **Physical Measurement Laboratory**
- **Engineering Laboratory**
- **Information Technology Laboratory**
- **Communication Technology Laboratory**
- **Center for Nanoscale Science and Technology**
- **NIST Center for Neutron Research**

Metrology Laboratories	Technology Laboratories	National User Facilities
Driving innovation through Measurement Science and Standards	Accelerating the adoption and deployment of advanced technology solutions	Providing world class, unique, cutting-edge research facilities

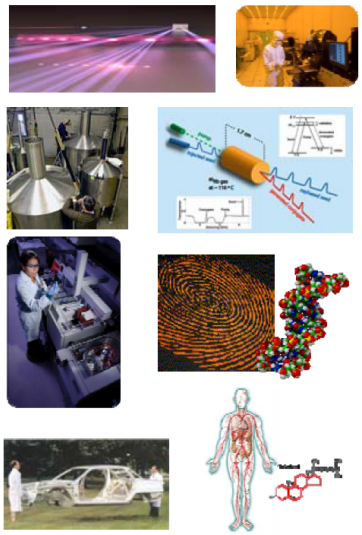
- Advanced Communications
- Bioscience & Health
- Building and Fire Research
- Cybersecurity
- Chemistry, Math, Physics
- Electronics & Telecommunications
- Energy; Environment/Climate Assessment
- Information Technology
- Manufacturing
- Materials Science
- Nanotechnology
- Neutron Science
- Public Safety & Security
- Transportation

NIST Metrology Laboratories

Responsible for advancing the state-of-the-art for measurement science and the dissemination of this metrology into industry, other government agencies, and academia.

- **The Material Measurement Laboratory** (MML) **serves as the national reference laboratory for measurements in the chemical, biological, and material sciences** through activities ranging from fundamental and applied research, to the development and dissemination of certified reference materials, critically evaluated data, and other programs/tools to assure the quality of measurement results.

- **The Physical Measurement Laboratory** (PML) **develops and disseminates the national standards of length, mass, force and shock, acceleration, time and frequency, electricity, temperature, humidity, pressure and vacuum, liquid and gas flow, and acoustic, ultrasonic, and ionizing radiation** through activities ranging from fundamental measurement research to provision of measurement services, including calibration services, standards, and data.



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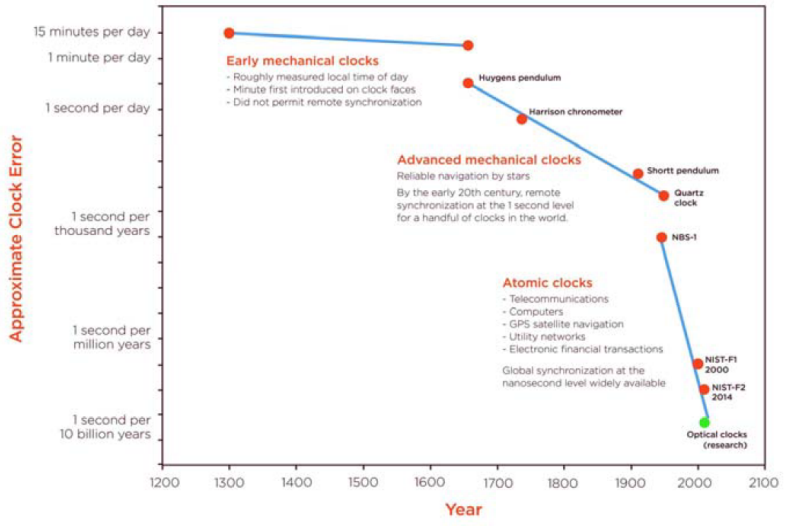
Leading the world in the realization of international system of units



TIME

Record-setting Atomic Clock

NIST/JILA's strontium lattice atomic clock, accurate to:
1 second in 15 billion years

Why this level of Precision Matters:

Electric power grid requires:

synchronization to about 1 millionth of a second per day

Modern telecommunications and computer network systems require:

synchronization to about 1 millionth of a second per day

GPS system requires:

synchronization to about 1 billionth of a second per day.

NIST official time is used to time-stamp hundreds of billions of dollars in U.S. financial transactions each working day.

NIST (NBS) established in 1901
Organic Act of 1901; Updated in 2008

Functions and activities of the Institute include:

- custody and dissemination of national standards
  - comparison of US national standards with those of other nations
- determination of physical constants and the properties of materials,
- solutions to measurement and standards problems of other government agencies
- providing (Innovation) assistance to industry


THE EVENING STAR, MONDAY, MARCH 11, 1901

CORRECT MEASURES

Position of the New Bureau of Standards.

LABORATORY TO BE ERECTED

Prof. Stratton, the Director, Details Need of Establishment.

A HANDICAP REMOVED

House Committee on Coinage, Weights and Measures ...on the establishment of the National Bureau of Standards (now NIST) May 3, 1900

Unit		*Reference value used to define the unit*		
		in current SI	*in the new SI*	
second,	s	$\Delta\nu(^{133}Cs)_{hfs}$	$\Delta\nu(^{133}Cs)_{hfs}$	Cs hyperfine splitting
metre,	m	c	c	speed of light in vacuum
kilogram,	**kg**	$m(\mathcal{K})$	h	**Planck constant**
ampere,	A	μ_0	e	elementary charge
kelvin,	K	T_{TPW}	k	Boltzmann constant
mole,	**mol**	$M(^{12}C)$	N_A	**Avogadro constant**
candela, source	cd	K_{cd}	K_{cd}	luminous efficacy of a 540 THz

NMI's around the world are working together to link our measurement system to fundamental constants of nature

Redefinition of the kilogram

Currently:

"The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram." *3rd CGPM, 1901*

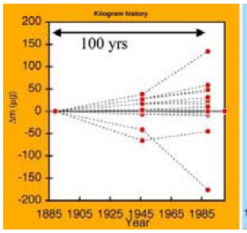
However:

New York Times
(27 May 2003)

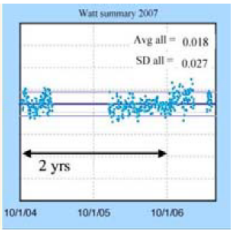
Scientists Struggling to Make the Kilogram Right Again

...The kilogram is getting lighter, scientists say, sowing potential confusion over a range of scientific endeavor...

Scatter in IPK copies



Scatter of E-kilogram efforts



Same vertical scale!

Int. Gen. Com Weights and Measures has recommended its redefinition.

Basis for the Redefinition of the Kilogram: Two approaches

- **Physics** – by relating mass to power using a Watt Balance

  Planck's Constant (*h*)

- **Chemistry** – as a fixed

  number of atoms Avogadro's

  $1\ \text{kg} = 10^3 \cdot \{N_A\} \cdot m_u$

  where $m_u = 1/12 \cdot m(^{12}\text{C})$

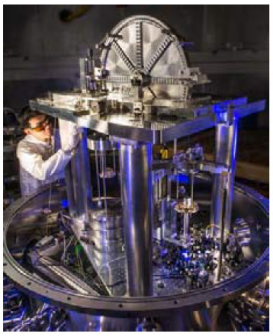
Redefining the international system of units

Physical kilogram artifact (1889)

MASS

Redefining mass from a physical artifact to a constant of nature by 2018.

Working with other national metrology institutes around the world, NIST researchers are carefully measuring **Planck's constant** so that it can be the cornerstone of a new, improved International System of Units.



Int. Avogadro Project

In addition to maintaining the more traditional National Physical Measurement Standards, **we also focus a significant portion of our research and measurement services activities on addressing contemporary societal needs**

NIST has become:

- a key player on the Administration's Innovation Team
- the nation's go-to agency for measurements, standards, and technology

1901

Supporting the Industrial Revolution

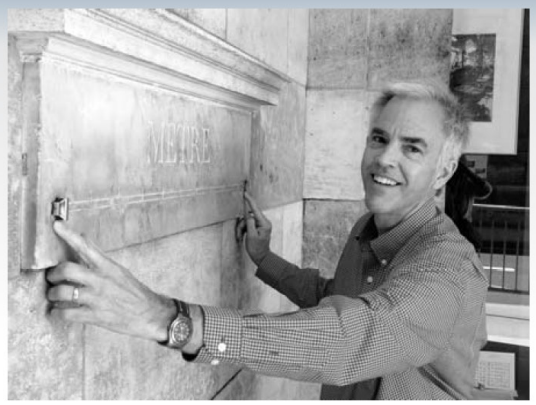
- Interoperability of fire hose screw threads
- Light bulb standards
- Standards for irons and steels
- Working with ICC to reduce railway accidents

2016

- Advanced communications
- Advanced manufacturing
- Advanced materials
- Bioscience and Health
- Climate assessment
- Cyber-physical systems
- Cybersecurity
- Disaster resilience
- Forensic science
- Quantum science

Changing of the Guard

Carol Hockert



Doug Olson

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What Have We Done for You Lately?

Trained more than 740 students

- Lab metrology
- Weighing and measuring devices
- Package control

Train the trainer boot camp

- Spring 2017

Grant to NCWM--$100,000

- Travel
- Training

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What Have We Done for You Lately? (contd.)

Test procedures for hydrogen dispensers

- Incorporated into Handbook 44

Electric Vehicles Refueling Devices

- Adopted draft code, July 2016
- Finalizing standards for field testing electric vehicle fueling stations

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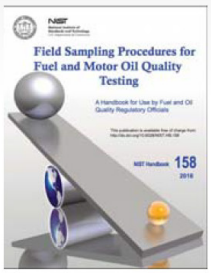
What Have We Done for You Lately? (contd.)

Liquefied Natural Gas

- Sale by mass or unit equivalencies

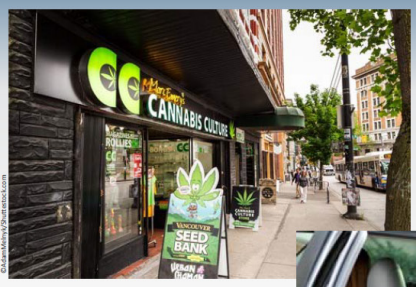
Petroleum fuels and motor oil

- Handbook 158, April 2016



21

Responding to New Products and Services



Legalized Sale of Marijuana in some States

- Need suitable measuring equipment
- Agreed requirements
- New inspection approaches
- Education of businesses

Mobile-app-based Transportation Services

- Measurement challenges for phone GPS
- Appropriate standards for these services

22

Where Do We Want to Be Tomorrow?

Accomplishing more with less

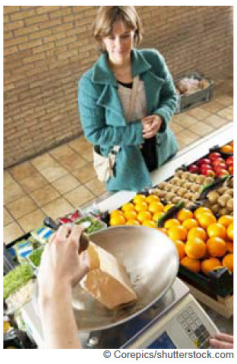
Possible approaches:

- Random sampling for some inspections
- More checks on food processing packaging
- Inspections of railroad conveyor scales for coal or moisture meters for grain
- Sales by energy content of fuels
- Risk-based inspections based on past compliance

23

Lack of recognition is a good thing!

The weights and measures system in the U.S. works so well that its accuracy is taken for granted.



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It's not always pleasant, but it's fair -- Thanks to your efforts.

A challenge to you

The foundation of all knowledge is accurate data.

- **NIST and NCWM need your help to collect performance and impact data.**
- **We need you to be our boots on the ground.**
- **Let's work together to define a methodology for data collection.**
- **With the right data, we can do the analysis needed to truly PROVE the WORTH of your efforts to our communities and economy.**

Looking Ahead

NIST and NCWM

- More than 100 years of productive collaboration
- Achieving equity in the marketplace for buyers and sellers
- Looking forward to continuing this mutually beneficial relationship!

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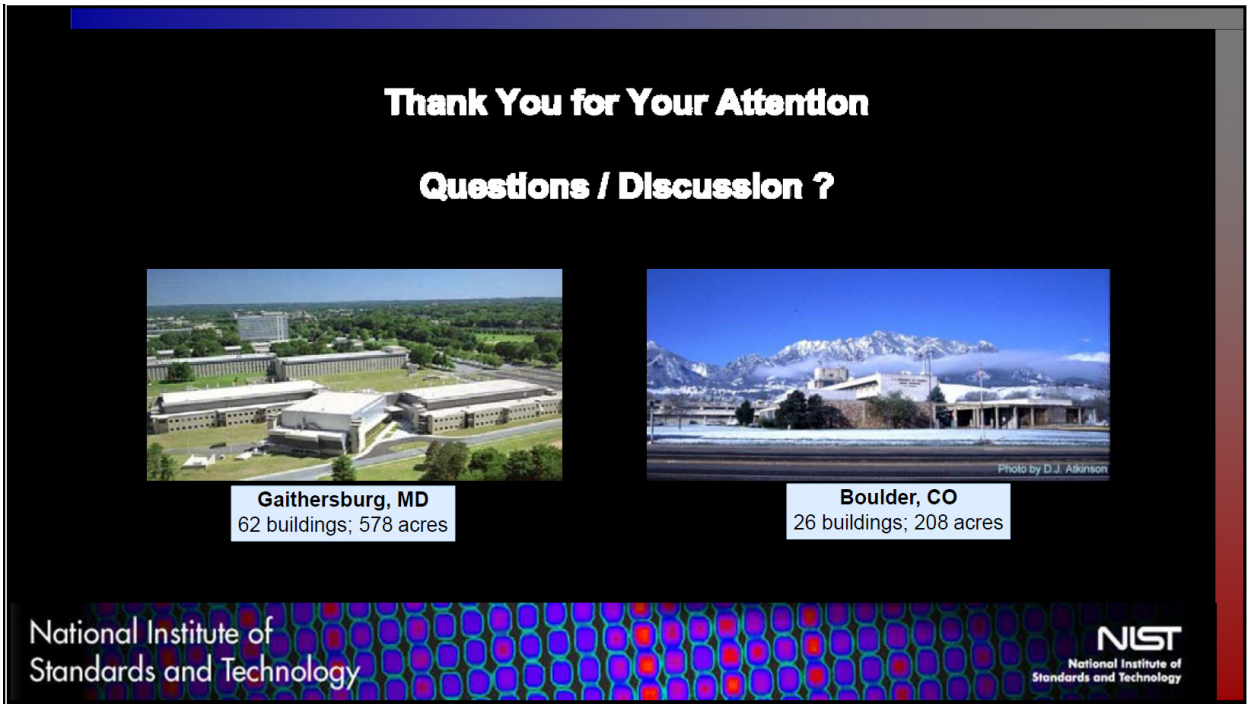

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National Conference on Weights and Measures
Chairman's Address

Denver, Colorado

July 26, 2016

Jerry Buendel
Department of Agriculture, Washington

It's my pleasure to welcome everyone to Denver and the 101st Annual Meeting of the National Conference on Weights and Measures (NCWM). We continue to have excellent attendance with 240 attendees. This includes 39 state representatives, our Canadian partners, two officials from Curacao, and one from American Samoa.

I want to thank our distinguished guests, Dr. Willie May, Director of the National Institute of Standards and Technology (NIST). We appreciate NIST's continuing commitment to NCWM. NIST's mission of accelerating innovation and bringing world class technology to the marketplace highlights our need as a standard setting organization to move forward quickly with regulations to protect consumers and assure fair competition in the marketplace.

Thanks to Dr. Donna Lynne, Colorado's Lieutenant Governor. We are grateful for her time and support of the important work we do here. Thanks also for the administration's support of Colorado's measurement standards programs – the good work they do provides leadership on topics such as Compressed Natural Gas (CNG) and significantly influences national approaches to these emerging areas. Mr. Mahesh Albuquerque and his staff make valuable contributions to this Conference and our regional Conference. Mr. Nick Brecham has helped my home state, Washington, with regulating scales used for recreational marijuana sales.

In looking at some facts on Denver, I found that Denver lays claim to the invention of the cheeseburger. The trademark for the name Cheeseburger was awarded to Denver businessman Mr. Louis Ballast in 1935.

Last year, I chose the theme of "NCWM-Strengthening a Progressive Organization" and set three ambitious goals for this year. I want to report to you on the progress we made in meeting the goals.

The first goal was to develop basic competency exams that can be used by jurisdictions to certify service technicians and to assure newly hired regulatory staff are progressing in their training and are competent to begin their regulatory duties. The Professional Development Committee has risen to the challenge and has made excellent progress towards this goal. They will be contacting the state directors and conducting a survey to see that they are on target with their efforts – thank you the Professional Development Committee (PDC) for keeping your customers first. I've talked to some registered service agents and heard they would welcome the chance to take a test once and use those test results to license in multiple states. I ask that each of you, both regulators and industry officials, to put these tests to work and continue to participate in training and testing that improve staff and the services they deliver.

A second goal was to continue our progress in telling our story. The Tool Kit Work Group has produced another video on scales and is near completion of videos on retail fuel station inspections and motor fuel quality. These short, concise videos tell our story in a concise and engaging way and can be used for a variety of audiences. The videos will be available on the NCWM website. I encourage you to take a look and put them to work. Thank you to Mr. Stephen Benjamin for producing the videos and the Associate Membership Committee (AMC) for your financial support.

My third, a priority goal, was to begin a systematic effort of improving our standards development process. Our current processes work, but we need to look at ways to develop standards that we can quickly and responsibly respond to an ever-changing marketplace, adapt to new technology and meet the needs of industry while safeguarding the interests of consumers. A charter team led by Mr. John Gaccione completed the first phase of that effort by delivering

a report on the current condition of our standard setting process. You heard Dr. Matt Curran present a report on that topic and the eight recommendations of the Committee. The Board plans to continue the effort into next year and will formulate a charter to move us forward in this improvement effort. You'll hear from Chair Elect Kristin Macey on her plans to continue that effort.

As you know, the Board is charged with overseeing the operation and administration of the Conference. We are growing on a number of fronts, and I'm pleased to report to you that we have a Board made up of talented, dedicated members, which are up to the challenge. I want to express my gratitude to them for their thoughtfulness and professionalism.

So, what are the challenges and accomplishments?

One of them is simply dealing with the number of issues we're handling. Because of the growth, we'll be revising our item numbering system.

We are on a regular cycle of updating policies, and we've made some changes this year. One of those policies clarified the roles and operations of subcommittees and workgroups that support the work of the standing committees. We've also made some changes to our meeting policies to provide for a student registration category – this year we have two young ladies in that category, Ms. Katlyn Kunselman and Ms. Holly Butcher – please stand and be recognized.

At this meeting the board approved the posting of job recruitments on the NCWM website. Members will be allowed to post job opportunities and everyone will have access to the postings.

We've published three new professional certification exams – large capacity scales, medium capacity scales, and vehicle-tank meters. Thank you again PDC for your efforts.

One of the most visible accomplishments is electronic voting – the new method will make our meetings more efficient and eliminate any counting mistakes.

I want to thank Ms. Carol Hockert for service and friendship and more importantly her leadership in strengthening the national measurement system. She has repaired the NCWM, NIST relationship and the training and workshops have been invaluable. She'll be missed.

Thanks too to the NIST technical advisors that we rely upon for the expertise and training they provide.

I know there's much more to come through our joint efforts. I'd like to welcome Dr. Doug Olson to the Conference. We look forward to continuing our work together in serving the consumers and businesses in our great nation. Doug will be visiting the regional conferences and states over the next year to learn more about our labs, regulatory programs, and the standards setting process.

Part of being Chairman is participating in the regional meetings. At each of the regions, I was impressed with the commitment and dedication to developing proposals and to improving our skills. I started the circuit in September of last year with my home region, the Western Weights and Measures Association (WWMA). We met in Boise, Idaho, where Mr. Kevin Merritt and his staff hosted us, and I had the privilege of serving as President. The next stop was Biloxi, Mississippi, where Mr. Gene Robertson put together a great conference and showed us the finest traditional southern hospitality. This year Northeastern Weights and Measures Association (NEWMA) and the Central Weights and Measures Association (CWMA) were back to back. NEWMA was held in Portland, Maine, where Mr. Marc Paquette of Vermont served as Chairman and treated us to some great Maine lobster. Ms. Lori Jacobson chaired the Central meeting. It was held in Rapid City, South Dakota, in the shadow of Mount Rushmore and the beautiful Black Hills. In addition to the conference, a NIST Retail Motor Fuel Dispenser class was held. It included attendees from three regions and was taught by Ms. Tina Butcher and three of our NIST Trained the Trainers.

All the conferences featured a NIST led management seminar on program evaluation. The seminar gave us some tools to take home and improve our programs. The Scale Manufacturers Association (SMA) roundtable stimulated some discussion on how we license and regulate service companies.

I also want to recognize and thank the NCWM staff for their dedication and hard work. Don (Onwiler), Elisa (Stritt), Tyler (Reeder), Jim (Truex), and Darrell (Flocken) keep us pointed in the right direction and do so much more than making these Conferences a success – I can always count on straight answers and quick reliable service.

Ms. Kristin Macey, Chair Elect, thank you for the help and insights you have given me throughout the year. You have helped me think through things and anticipate the needs of our organization. I can tell you that you have a strong, capable leader and a bright future ahead.

I challenge each of you to participate and contribute in some form or fashion. You'll find it to be an excellent growth opportunity as well as a fulfilling and satisfying experience.

So, we're off and running into the next 100 years. Again, thank you everyone for attending and participating and thank you for making NCWM a strong, successful organization. It has been a privilege and a pleasure to serve as your Chairman.

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National Conference on Weights and Measures
Chairman Elect's Address

Denver, Colorado
July 28, 2016

Kristin Macey
Director, Division of Measurement Standards
Department of Food and Agriculture, California

I am honored to be standing here before you as the new chairman of the National Conference on Weights and Measures (NCWM). Some of you may be aware that I began my weights and measures career as an inspector for the Colorado Department of Agriculture with a territory that spanned from the Continental Divide through Colorado Springs and all the way out to the Kansas border. I was promoted to Director of Colorado's Weights and Measures Programs in 2002 until being whisked away to California in 2007. Today, I stand before you as California's State Director of Weights and Measures, so, I guess my first "thank you" is to the Nominating Committee for making the timing of this acceptance speech in my old home town, and home state, very special for me.

Since I started in our business, there have been many changes to the words we use today. Uber was a foreign word that meant really super; a skimming device was a strainer one used to keep the soup clear during cooking; friend was a noun, not a verb; Tweet was the sound made by a bird; and a weed was something bad you sprayed with herbicide. Some of the traditional words we used then are rarely used today: pivots and bearings; steelyards; and analog indications. However, some words and phrases in our vocabulary never seem to go away. Automatic temperature compensation and moisture loss allowance still mean the same, and they are still active topics even after 100 years of discussion at the National Conference on Weights and Measures. So, who knows – while specific words like Uber and credit card skimmers might fade away, we can rest assured that the general requirements and fundamental considerations in our handbooks that provide consumer protection and equity will be as commonplace one hundred years into the future!

This Conference is steeped in tradition, yet inevitably influenced by new ideas and technology. That is why my theme for this year is "Tradition and Technology: Finding the Right Balance." Just as weights and measures affects nearly every aspect of our daily lives, so does technology. Most Americans can't imagine a life that does not include a smartphone or computer. Technology has revolutionized the ways companies conduct business and develop competitive advantages in the marketplace. Some of these technology breakthroughs demand our immediate attention. Technology that catches on doesn't wait for us to do a careful analysis. Sometimes it creates de facto standards faster than we can codify them in the NIST handbooks.

Our standing committees are being strained by an ever-growing number of agenda items for review. Our traditional "recipe" for adopting standards, which has worked so well for decades, suddenly seems sluggish. If our job is to set measurement standards that will address current marketplace needs, we must become more responsive and agile in our process. It's time for the Conference to re-examine the way we do business. I applaud Mr. Jerry Buendel for creating a Charter Team this past year to examine our standards setting process, and Mr. John Gaccione for taking on the role as team leader. I believe this introspection is important to the Conference for if we do nothing, there is real potential to denigrate the Conference's reputation as a standard setting organization.

One thing I am very cognizant of is the need for a thoughtful, deliberative process. That's why I'm going to ask the Charter Team to slow down a bit this next year before jumping to solutions. Our very own Mr. Darrell Flocken is trained in process analysis; he is a black belt in Lean Six Sigma. The Board of Directors and I will explore using him or another trained expert to conduct an orderly review of the problem areas identified before rushing to any next steps. A little more time to do the right thing won't hurt us. Look at what happened yesterday. We rolled out electronic voting 30 years after it was first discussed at the Conference!

In addition to the Charter Team exercise, my other major goal for this year is to cement a solid relationship between the Conference and the Office of Weights and Measures (OWM) within the National Institute of Standards and Technology. The Conference has a golden opportunity when the new chief, Dr. Doug Olson, begins his duties in February 2017. Mr. Don Onwiler, the Board of Directors, and I will be educating the chief about our organization. We will point to our tradition and the trusted relationship we had with Ms. Carol Hockert. As you heard from Dr. Willie May this week, Dr. Olson plans to attend regional conferences and other events, so please make him welcome and help lead him to the broad network of stakeholders who will be critical to his education and success. It is my hope that we can inspire the new chief to continue and maybe even increase the level of services that NIST provides in the course of its mission to promote uniformity in U.S. weights and measures.

The National Conference on Weights and Measures' National Type Evaluation Program (NTEP) embraces new technology by approving new device types for commerce. Its job is not to squash innovation, but to ensure that the new technology will work as advertised and be suitable for commerce. With the expansion of zero emission vehicles across the United States, I hope that this next year will see applications for NTEP to evaluate hydrogen fuel dispensers and electric charging stations. This is exactly why we have a provision for tentative codes in NIST Handbook 44 ("Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices").

My last major goal for this year is to stay the course for the good work the Professional Development Committee (PDC) is doing with professional certification exams for industry members and weights and measures officials. In addition to the training facilitated by the NIST training grants, these certifications will be our legacy to the next generation of weights and measures professionals. Over the last couple of years, the PDC has risen to the challenge and developed a model field training program and exams suitable for different levels of competency. I look forward to the development of the basic competency examinations, and thank Mr. Ross Andersen (NCWM Certification Coordinator) for his efforts, guidance, and consistent approach to this process.

In closing, let me say that the National Conference on Weights and Measures has both a rich tradition and a bright future, and we can look with pride and confidence in both directions. All members have a vested interest in ensuring that the Conference continues as a recognized leader for its integrity and creativity in the standards setting process. I hope you stay actively engaged as we move forward. I thank you for the trust you have placed in me and look forward to an exciting year with many new opportunities.

At this time, I would like to make the following appointments:

Specifications and Tolerances (S&T) Committee:

- Josh Nelson, Oregon

Laws and Regulations (L&R) Committee:

- Hal Prince, Florida
- Michelle Wilson, Arizona: to fill the vacancy caused by Ha Dang's resignation,

Professional Development Committee (PDC):

- Marco Mares, San Diego County, California
- Gene Robertson, Mississippi: to fill the vacancy caused by Doug Killingsworth's resignation
- Lori Jacobson, South Dakota: to fill the vacancy caused by Julie Quinn's advancement to the NCWM Board of Directors
- Julie Quinn, Minnesota: to fill the Safety Liaison position

Nominating Committee:

- Jerry Buendel, Washington, as Chair
- John Gaccione, Westchester County, New York

- Stephen Benjamin, North Carolina
- Kurt Floren, Los Angeles County, California
- Joe Gomez, New Mexico
- Charlie Carroll, Massachusetts

Presiding Officers at the 2017 Annual Conference in Pittsburgh, Pennsylvania will be:

- Jack Walsh, Town of Wellesley, Massachusetts
- Marc Paquette, Vermont
- Tim Chesser, Arkansas
- Loren Minnich, Kansas
- The Sergeants-at-Arms at the 2017 Annual Conference will be Pennsylvania officials determined later.

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Roll Call of the States

The Roll Call of the States is taken at the commencement of the Voting Session of the Annual Meeting.

Alabama	Kentucky **(X)**	Northern Mariana Islands
Alaska	Louisiana	Ohio **(X)**
American Samoa	Maine **(X)**	Oklahoma
Arizona **(X)**	Maryland **(X)**	Oregon **(X)**
Arkansas **(X)**	Massachusetts **(X)**	Pennsylvania **(X)**
California **(X)**	Michigan **(X)**	Puerto Rico
Colorado **(X)**	Minnesota **(X)**	Rhode Island
Connecticut **(X)**	Mississippi **(X)**	South Carolina **(X)**
Delaware	Missouri **(X)**	South Dakota
District of Columbia **(X)**	Montana **(X)**	Tennessee **(X)**
Florida **(X)**	Navajo Nation	Texas **(X)**
Georgia **(X)**	Nebraska **(X)**	Utah **(X)**
Guam	Nevada **(X)**	Vermont
Hawaii **(X)**	New Hampshire **(X)**	Virgin Islands
Idaho **(X)**	New Jersey **(X)**	Virginia **(X)**
Illinois **(X)**	New Mexico **(X)**	Washington **(X)**
Indiana	New York **(X)**	West Virginia
Iowa **(X)**	North Carolina **(X)**	Wisconsin **(X)**
Kansas **(X)**	North Dakota	Wyoming

Present (X): 39
Absent: 18

101st NCWM Annual Meeting/Award Recipients

Honor Awards

For 5 Years Attendance

- Sprague Ackley
- Holly Alfano
- Ann Boeckman
- Bill Callaway
- Matthew Curran
- Mark Flint
- Frank Greene
- Steven Harrington
- John Hughes
- Doug Killingsworth
- Tom Palace
- Lance Robertson
- Kevin Upschulte
- Jane Zulkiewicz

For 10 Years Attendance

- Tim Chesser
- Dave Rajala

For 15 Years Attendance

- Loretta Carey
- Constantine Cotsoradis
- Paul Lewis

For 20 Years Attendance

- Rodney Cooper

For 25 Years Attendance

- Tina Butcher
- Christopher Guay

For 35 Years Attendance

- Charles Carroll

Special Recognition Awards

Board of Directors

- Treasurer – Raymond Johnson, New Mexico
- At-Large – Steve Giguere, Maine
- Associate Membership – Christopher Guay, Procter and Gamble, Co.

Laws and Regulations Committee

- Richard Lewis, Georgia

Professional Development Committee

- Angela Godwin, Ventura County, California

Specifications and Tolerances Committee

- Mahesh Albuquerque, Colorado

Presiding Officers

- Tim Chesser, Arkansas
- Steve Harrington, Oregon
- Laurence Nolan, Los Angeles County, California
- Jack Walsh, Town of Wellesley, Massachusetts

Chaplain

- Constantine Cotsoradis, Flint Hills Resources

Parliamentarian

- Lou Straub, Fairbanks Scale, Inc.

Sergeants-at-Arms

- Rich Holcomb, Colorado Division of Oil and Public Safety
- Alberto Villagomez, Colorado Division of Oil and Public Safety
- Scott Wagner, Colorado Division of Oil and Public Safety

Associate Membership Committee

- Bill Callaway, Crompco, as Secretary/Treasurer
- Richard Shipman, Rice Lake Weighing Systems Inc., as Vice-Chair
- David Calix, NCR Corporation, as Chair

Nominating Committee

- Stephen Benjamin, North Carolina
- Charles Carroll, Massachusetts
- Kurt Floren, Los Angeles County, California
- John Gaccione, West Chester County, New York
- Joe Gomez, New Mexico
- Randy Jennings, Tennessee
- Ronald Hayes, Missouri, as Chair

Credentials Committee

- Philip Wright, Texas Department of Agriculture, Texas
- Matt Maiten, Santa Barbara County, California
- Darrell Flocken, NTEP Specialist
- Fran Elson-Houston, Ohio, as Chair

Distinguished Service Awards

Figure 1. Distinguished Service Award to Mr. Mark Coyne, Brockton, Massachusetts

Mr. Mark Coyne of Brockton, Massachusetts (center), receives the Distinguished Service Award form Conference President, Dr. Willie May (NIST, Director [on left]) and Mr. Jerry Buendel, NCWM Chairman (on right).

Figure 2. Distinguished Service Award to Ms. Carol Hockert, NIST, Office of Weights and Measures, Retired.

Mr. Kenneth Bucher, NIST/OWM (center), receiving the Distinguished Service Award on the behalf of Ms. Carol Hockert, Retired Chief, of NIST/OWM. Pictured from left to right: Dr. Willie May, Mr. Kenneth Butcher, and Mr. Jerry Buendel**.**

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Report of the NCWM Board of Directors

Jerry Buendel, Chair
State of Washington

100 INTRODUCTION

This is the report of the Board of Directors (BOD) (hereinafter referred to as the "Board") for the 101th Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, "Board Report," testimony heard at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The voting items presented below were adopted as presented when this report was approved.

Table A identifies the agenda and appendix items by reference key, title of item, page number, and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of an item's reference key are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered on an individual basis; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows. 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), and 2) proposed new language is indicated with an **underscore bold faced font** (e.g., **new items**). When used in this report the term "weight" means "mass".

Note: It is the policy to use metric units of measurement in publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to U.S. customary units.

Subject Series List

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
AMC	Associate Membership Committee	NTEP	National Type Evaluation Program
CTT	Conformity to Type	OIML	International Organization of Legal Metrology
ISWM	International Society of Weighing and Measuring	OWM	Office of Weights and Measures
MAA	Mutual Acceptance Arrangement	PDP	Principal Display Panel
L&R	Laws and Regulations Committee	PDC	Professional Development Committee
NCWM	National Conference on Weights and Measures	VCAP	Verified Conformity Assessment Program
NIST	National Institute of Standards and Technology		

Table C
Summary of Voting Results

Reference Key Number	*House of Senate Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
120-4	Voice Vote				Adopted
120-5	Yeas: 51 Nays: 22				Adopted
To Accept the Report	-Voice Vote				Adopted

Details on All Items
(In order by Reference Key)

110 ACTIVITY REPORTS

110-1 I Membership

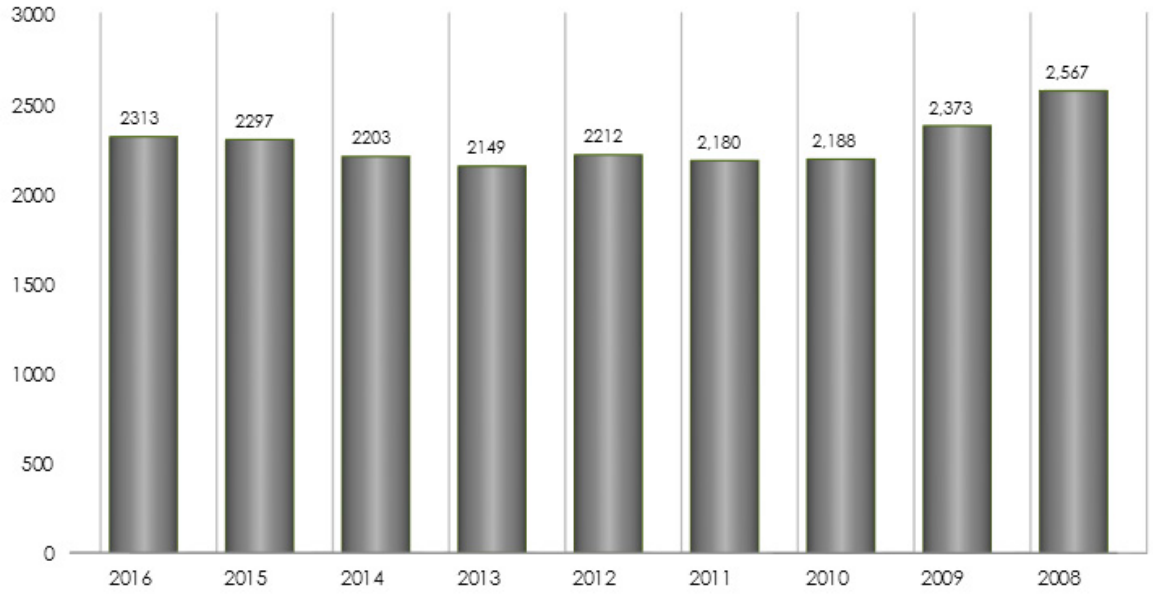
The chart and graph below show NCWM membership levels as of June 30 of recent years by membership categories. NCWM has experienced a gradual growth in membership levels for the past four years. This growth is most significant in the category of state government weights and measures officials, which increased 21 % since 2013.

The potential growth remains significant, and NCWM continues to enhance programs and services that add value to membership.

Annual Membership Totals

Year / Type	June 2016	June 2015	June 2014	June 2013	June 2012	June 2011	June 2010	June 2009	June 2008
Associate	803	806	802	818	842	813	814	822	848
Foreign Associate	89	76	64	50	58	62	53	53	56
Total Associate	**892**	**882-**	**866**	**868**	**900**	**875**	**867**	**875**	**904**
State Government	675	665	603	558	589	567	565	696	831
Local Government	492	491	492	486	487	495	524	558	554
Total Active	**1167**	**1156**	**1095**	**1044**	**1076**	**1062**	**1089**	**1254**	**1385**
NIST	14	16	16	16	16	16	12	14	15
Other Federal Government	11	11	9	10	11	11	12	10	9
Foreign Government	14	13	13	13	14	14	12	24	22
Retired	215	219	207	198	195	202	196	196	232
Total Advisory	**254**	**259**	**242**	**237**	**236**	**243**	**232**	**244**	**278**
Grand Total	**2313**	**2297**	**2203**	**2149**	**2212**	**2180**	**2188**	**2,373**	**2,567**

Annual -Membership Totals as of June 30 Each Year



110-2 I Meetings

Attendance at the 2016 Interim Meeting in San Diego, California, far exceeded the attendance of the Interim Meetings in recent history. It was an opportunity for many California county officials to attend and participate in our standards development process. There were also some special additions to the program this year. On Sunday morning and afternoon, there was a Transportation Network Systems Forum that included presentations by representatives from Uber and Lyft. On Wednesday morning, there was a very well attended session on investigations of credit card skimmers at fuel stations. Panelists included Dr. Matthew Curran of Florida, Mr. Craig VanBuren of Michigan, and special agents from the FBI and Secret Service. This session drew much attention from local media including camera crews from seven local television stations. Because of the success of this event, plans will be made to continue the Wednesday morning educational sessions.

The 101st Annual Meeting was held at the Grand Hyatt in downtown Denver, Coloratdo, with the third-highest attendance of the past 10 years. It included nearly double the normal number of exhibitors. The Committees successfully moved many important items from their agendas.

Interim Meetings:

- January 8 - 11, 2017 Hyatt Regency San Antonio, San Antonio, Texas
- January 21 - 24, 2018 Sirata Beach Resort and Conference Center, St. Petersburg, Florida

Annual Meetings:

- July 16 - 20, 2017 102nd Annual Meeting: Omni William Penn Hotel in Pittsburgh, Pennsylvania
- July 15 - 19, 2018 103rd Annual Meeting: Hyatt Regency in Tulsa, Oklahoma
- July 2019 104th Annual Meeting: Location is to be determined in Central Region

The Board of Directors strives to plan meetings in locations that have reasonably priced airline service and are within government per diem rates. The board also evaluates locations and bids from hotels based on their ability to offer comfortable rooms, quality meeting space, and a variety of nearby entertainment and dining options.

The 2017 Interim Meeting will be located at the Hyatt Regency San Antonio, San Antonio, Texas. This beautiful hotel is in a spectacular location on the famous San Antonio Riverwalk and overlooks the historic Alamo Mission. For more information about the 2017 NCWM Interim Meeting, go to **http://www.ncwm.net** click on meetings or contact Ms. Elisa Stritt, NCWM Office Manager, at (402) 434-4872 or **elisa.stritt@ncwm.net**.

In July 2017 NCWM will hold the 102nd Annual Meeting at the historic Omni William Penn Hotel in downtown Pittsburgh, Pennsylvania. For more information about this meeting, go to **http://www.ncwm.net/sems/event_detail/2017-annual-pa** or contact Ms. Elisa Stritt, NCWM Office Manager, at (402) 434-4872 or **elisa.stritt@ncwm.net**.

110-3 I Participation in International Standard Setting

Mr. Kenneth Butcher, NIST, OWM, provided a report during Open Hearings of the 2016 NCWM Annual Meeting in Denver, Colorado. An updated report is included as an appendix to this agenda of the Board of Directors. (See Appendix A.)

See the NTEP Committee Agenda for additional reports on NCWM's involvement internationally including the Mutual Recognition Arrangement (MRA) with Measurement Canada and the Mutual Acceptance Arrangement (MAA) with OIML.

110-4 I Associate Membership Committee (AMC) Activity

The Associate Membership Committee (AMC) is organized in accordance with the Bylaws of the National Conference on Weights and Measures, Inc. In addition, AMC operates by its own Bylaws which are available on the Committee pages of **http://www.ncwm.net**. AMC meets at least two times per year in conjunction with NCWM Interim and Annual Meetings. It consists of between 5 and 10 members who, amongst themselves, elect officers to serve as Chairman, Vice-Chairman, and Secretary/Treasurer.

AMC has established a reputation of promoting and improving NCWM and has demonstrated its desire to improve understanding of weights and measures activities in public and private sectors.

The NCWM membership dues for Associate members of $90 are $15 higher than that for Active or Advisory members. The extra $15 is not for NCWM, but rather is placed in a separate account referred to as the AMC Fund. While AMC has discretion to allocate the funds in various ways, one means of allocating these funds is to provide grants in support of weights and measures training. The Committee receives applications and awards training grants from the AMC fund in accordance with their "Guidelines for Selection and Approval of Training Funds," which are posted on the Committee's portion of **http://www.ncwm.net**. Downloadable applications for training grants and reimbursement forms are also available at this site.

The criteria to receive AMC funds for training are as follows:

1. Funding request forms that are complete, specific, and detailed will receive priority attention for approval. Based on the degree of missing or ambiguous information provided, individual requests may not be given any consideration during the AMC review process pending further clarification.

2. Training requests that benefit higher numbers of participants are generally preferred over those for fewer or single-person benefit. Multi-state training that encourages uniformity will also be given priority consideration.

3. In general, attending meetings such as NCWM Annual Meetings, Interim Meetings, or regional associations meetings will not be considered training.

4. As a lower priority, requests for the purchase of training materials will be considered, but requests for purchase of assets (such as projectors) will not.

5. Reasonable funding for travel and expenses will be considered if it is necessary to acquire an "expert trainer" that would benefit a high number of weights and measures officials. This will be an option when qualified volunteers are not available.

Regulatory agencies are encouraged to make use of these funds to improve training opportunities and the expertise of inspection personnel.

AMC members are also looking for new, perhaps innovative ways to play a more effective role in the NCWM structure to further improve the organization.

At the 2016 Annual Meeting, Mr. Chris Guay, Procter and Gamble Co., provided a description of the Associate Membership and encouraged all members, especially Associate members. to attend their meetings, which are held at each NCWM Interim and Annual Meeting.

See Appendix B for the AMC Meeting Minutes.

110-5 I Task Groups, Subcommittees, Steering Committees

Focus Groups, Task Groups, Subcommittees, and Steering Committees:
Focus Groups (FG), Task Groups (TG), Subcommittees, and Steering Committees (SC) are created by appointment by the NCWM Chairman and operate as defined in NCWM Policy 1.5.1. Subgroups Supporting the Work of the Organization. A TG is given a specific charge, and it reports to the appropriate NCWM standing Committee. A TG will disband at the completion of its assignment. A Subcommittee is charged with ongoing responsibilities in support of a Standing Committee (Committee) in a specific field of expertise. A SC is charged with unbiased fact-finding that will assist NCWM membership in decision processes for difficult issues. A SC will disband upon completion of its specific charge.

NCWM offers resources to these TGs and Subcommittees including meeting space at Interim and Annual Meetings, conference calling and web meeting services, group e-mail services, a dedicated web page for posting and archiving documents related to their work, and broadcast e-mail services to reach targeted audiences. Additionally, NIST OWM has provided technical advisors and web meeting forums. These tools enable year-around progress of TG and Subcommittee work.

Because NCWM TGs and Subcommittees report directly to NCWM Standing Committees or Board of Directors, any new proposals developed through one of these groups may appear in NCWM Publication 15 without first being vetted through a regional association. Any such proposals are properly vetted through the open hearings of NCWM.

The Board expresses great appreciation to the volunteers who serve in support of the work of this organization.

Fuels and Lubricants Subcommittee:
The group reports to the Laws and Regulations (L&R) Committee. For more information, contact:

Chair
Dr. Matthew Curran
Florida Department of Agriculture and Consumer Service
3125 Conner Boulevard, Building 2
Mail Stop L2
Tallahassee, FL 32399-1650
Phone: (850) 921-1570
Fax: (850) 921-1548
E-Mail: **Matthew.Curran@FreshFromFlorida.com**

Packaging and Labeling Subcommittee:
The group reports to the L&R Committee. For more information, contact:

Chair
Mr. Christopher Guay
Procter and Gamble Co.
One Procter and Gamble Plaza
Cincinnati, OH 45202
Phone: (513) 983-0530
Fax: (513) 983-8984
E-mail: **guay.cb@pg.com**

Moisture Loss Task Group:
The group reports to the Laws and Regulations Committee. For more information, contact:

Chair
Mr. Kurt Floren
LA County Agricultural Commissioner/Weights and Measures
12300 Lower Azusa Road
Arcadia, CA 91006
Phone: (626) 575-5451
Fax: (626) 350-3243
E-mail: **kfloren@acwm.lacounty.gov**

Multi-Point Calibration Task Group:
The group reports to the Specifications and Tolerances (S&T) Committee. For more information, contact:

Chair
Ms. Julie Quinn
Minnesota Department of Commerce
14305 South Cross Drive, Suite 150
Burnsville, MN 55306
Phone: (651) 539-1555
Fax: (952) 435-4040
E-mail: **julie.quinn@state.mn.us**

Promotional Tool Kit Task Group:
The group reports to the Board of Directors. For more information, contact:

Chair
Mr. Stephen Benjamin
North Carolina Department of Agriculture
Raleigh, NC 27699
Phone: (919) 707-3225
E-mail: **steve.benjamin@ncagr.gov**

Organometallics Task Group:
The group reports to the Fuels and Lubricants Subcommittee and the L&R Committee. For more information, contact:

Chair
Mr. Randy Jennings
Tennessee Department of Agriculture
P.O. Box 40627
Nashville, TN 37204
Phone: (615) 837-5327
Fax: (615) 837-5335
E-mail: **randy.jennings@tn.gov**

Weigh-in-Motion Vehicle Scale Task Group:
The group reports to the S&T Committee. For more information, contact:

Chair
Mr. Alan Walker
Florida Department of Agriculture and Consumer Services
6260 Buckingham Rd
Fort Meyers, FL 33905
Phone: (850) 274-9044
E-mail: **Alan.Walker@freshfromflorida.com**

110-6 I Regional Association Activities

Upcoming Regional Association Meetings:

Fall 2016 Meetings

WWMA Annual Meeting
September 10-15, 2016
Honolulu, Hawaii
Contact: Jeri Kahana
E-mail: **Jeri.M.Kahana@hawaii.gov**

NEWMA Interim Meeting
October 25-26, 2016
Portsmouth, New Hampshire
Contact: James Cassidy
E-mail: **jcassidy@cambridgema.gov**

CWMA Interim Meeting
October 2-5, 2016
St. Charles, Missouri
Contact: Sherry Turvey
E-mail: **sherry.turvey@kda.ks.gov**

SWMA Annual Meeting
October 16-19, 2016
Arlington, Texas
Contact: Philip Wright
E-mail: **Philip.Wright@TexasAgriculture.gov**

Spring 2017 Meetings

CWMA Annual Meeting
May 22-25, 2017
Lincoln, NE
Contact: **Sherry Turvey** sherry.turvey@kda.ks.gov

NEWMA Annual Meeting
May 15-18, 2017
Saratoga Springs, New York
Contact James Cassidy
E-mail: **jcassidy@cambridgema.gov**

120 STRATEGIC PLANNING, POLICIES, AND BYLAWS

120-1 I Strategic Planning

The Executive Director presents a Strategic Plan progress report each year at the fall Board Meeting. The Board conducts a strategic planning session every other year in January at its quarterly meeting just prior to the Interim Meeting. The Board met Friday, January 8, 2016, in San Diego, California, prior to the NCWM Interim Meeting to do strategic planning for the new year. Members can review the Strategic Plan online at **https://www.ncwm.net** in the "About" section. The Board welcomes member input. Suggestions may be submitted to Executive Director, Mr. Don Onwiler at **don.onwiler@ncwm.net**.

There are five Goals in the NCWM Strategic Plan:

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

Goal 1: Enhance the NCWM as a national and international resource for standards development:
Under this goal, NCWM has recognized the benefit of participating in other organizations where appropriate as a means of drawing on mutual resources toward common goals and heightening awareness of NCWM. This has been very successful in recent years.

Also as part of this goal, NCWM is hoping to increase stakeholder participation in NCWM through outreach efforts.

Goal 2: Expand the role of the NCWM as a source of support for state and local weights and measures programs:
NCWM is increasing the number of press releases. This will raise the level of recognition for NCWM and its membership as a resource for expert information covering a vast array of topics.

Another part of this goal is to conduct surveys on occasion that benefit our members. In some cases, surveys are used to create benchmarks for comparison with future surveys.

A task group was formed and continues its work to develop a "toolkit" of items that can be used by program administrators to generate awareness and support for their programs. This toolkit is available on the NCWM website at **https://www.ncwm.net/resource/promotional-toolkit**. North Carolina took the lead in developing the first video which is now available. The Board of Directors and the Associate Membership Committee have each pledged matching funds toward 4 additional video productions.

New in 2015, NCWM began posting a "Tip of the Month" on its website. Ideas are welcome and should be addressed to Mr. Onwiler at **don.onwiler@ncwm.net**.

Also, new in 2015 is a strategy to develop guidance for retaining personnel and succession planning for positions in state and local weights and measures agencies.

Goal 3: Enhance the technical competence of individuals involved in weights and measures:
The Professional Certification Program has been a high priority under this goal. Mr. Ross Andersen serves as Certification Exam Coordinator working with the Professional Development Committee and Subject Matter Experts. Volunteer Subject Matter Experts are needed in the areas of LP Gas Meters and Price Verification. Anyone interested in assisting the writing and reviewing exam questions should contact NCWM.

The Professional Development Committee is also working with Mr. Andersen to develop two types of basic level exams; one type for service agents and the other for inspectors that are completing their initial training. See more discussion on this in the Professional Development Committee report.

There are several other strategies under Goal 3. Advancement toward those strategies includes a cooperative effort with NIST whereby NCWM uses grant funds from NIST to fund travel for approved trainers from around the country to assist with NIST training events. See the "Training" tab at **www.ncwm.net** for more information.

Goal 4: Continue to improve the National Type Evaluation Program:
In this support of this goal, NCWM surveys regulatory officials every two years to monitor how they access NTEP Certificates of Conformance in the field. The mobile version of the website has benefited them greatly. As technology advances, NCWM will have a better understanding for how it can make Certificates of Conformance more accessible.

Other strategies in Goal 4 are focused on training for applying information from NTEP Certificates of Conformance, maintaining viable laboratory support through authorized labs and international agreements, and continued implementation of the Verified Conformity Assessment Program.

Goal 5: Preserve the financial stability of NCWM:
The Board has studied potential hazards that could present a burden on NCWM's financial reserves as an attempt to be prepared. This is being balanced with continued efforts to improve services in support of customers and membership. The Board closely monitors the financial health of the organization through monthly reports and formal reviews at each of the board meetings. An independent audit of NCWM finances is conducted at the close of each fiscal year.

120-2 I Improving the NCWM Standards Development Process

Source:
NCWM Board of Directors (2016)

Purpose:
Assess the NCWM standards development process to determine ways to improve efficiency and participation.

Background/Discussion:
At the 100th NCWM Annual Meeting in 2015, several members suggested to the Board of Directors that the standards development process could be improved upon in ways in which it would make it move more efficient and at the same time encourage broader attendance and participation by stakeholders. Some suggestions included modeling NCWM's process to be more like an ANSI process and possibly voting on standards twice per year instead of once.

NCWM Chairman, Mr. Jerry Buendel has set out four phases in developing recommendations to improve the standards development process. In January 2016, he formed a Charter Team to begin Phase 1 of the plan and report back to the Board of Directors in July 2016. In Phase 1, the Charter Team will evaluate the NCWM's existing process and outline its strengths and weaknesses.

Charter Team Members are:

Member	Jurisdiction/Organization	Region/Association
John Gaccione, Chair	Westchester County, NY	Northeast Region
Joe Gomez	New Mexico	Western Region
Julie Quinn	Minnesota	Central Region
Dr. Matthew Curran	Florida	Southern Region
David Calix	NCR	Associate Membership
Robert Murnane	Seraphin Test Measure	Associate Membership
Don Onwiler	NCWM	
Carol Hockert	NIST OWM, Retired	

Charter Team Member, Dr. Matthew Curran, presented an overview of the team's report on Phase 1. He was asked to clarify what is meant when the team says it is considering an ANSI process. Mr. Curran explained that ANSI is just one of many options and no recommendation has been made. The final recommendation may be pieces of what other models use. A member expressed that it may be beneficial to vote two times per year, but it is important to not move items so quickly that there is not proper time for review by stakeholders. Mr. Curran responded that any concerns along the way may be brought directly to the task group. See Appendix C for a copy of the report.

Chair-Elect, Ms. Kristin Macey, will ask the team as its next step to consider a Lean Six Sigma approach of identifying and implementing specific tools to help the team meet its goals.

Since the existing standards development process and voting system are defined in NCWM Bylaws, there is high probability that any solutions would be brought to a vote of the general NCWM membership in the form of bylaw amendments.

The Board of Directors believes that this process should be slow and deliberate so any action taken will be well-conceived and in the best interest of NCWM and its stakeholders. The Board will communicate with membership throughout this process in open hearings, the newsletter, NCWM Publication 15 agendas and NCWM Publication 16 reports.

120-3 I Publication and Distribution of NCWM Work Products

Source:
Packaging and Labeling Subcommittee (2015)

Purpose:
Develop a plan for publication and distribution of new NCWM work products.

Background/Discussion:
The NCWM Package and Labeling Subcommittee (PALS) is developing a document that provides principles and recommendations to capture best practices for the many kinds of existing quantity related statements which appear on package Principal Display Panels (PDPs). These are statements which are present in addition to the required declaration of net quantity. The practice of adding these expressions has increased significantly over the past decade, and it is recognized that some statements can help consumers make fair value comparisons while others arguably may confuse or mislead consumers.

The principles and recommendations under development by PALS are intended to provide both manufacturers and regulators with standardized guidance regarding best practices for these kinds of statements to provide increased uniformity and statement integrity. Rather than attempt to create regulations covering these topics, which would require involvement of multiple federal agencies, PALS believes that the development of principles and recommendations provides an actionable and reasonable approach for bringing standardization and consistency to this topic.

A focus group within the Board of Directors provided the following recommendations for these guidance documents:

- Create a new tab on the website that would also have the handbooks.
- Duplicate the Interpretations and Guidelines in Section VI of Handbook 130, reorganize them by topic and post them to the website in the same tab.
- Guidance documents should be adopted by a vote of membership under the Board agenda or appropriate Standing Committee.
- Modify Form 15 to accommodate proposals related to the guidance documents
- In the process, also simplify Form 15.

The reorganized Interpretations and Guidelines from Handbook 130 were presented at the May 2016 Board Meeting. At that meeting, Mr. Ken Butcher, NIST/OWM, explained these were originally developed to provide leverage for enforcement agencies. The focus group will provide a final review of the new document. On completion of that review, the document will be posted to the NCWM Website.

The simplified Form 15 was approved and will be implemented immediately. The form was also modified to include its use in recommending changes to the new guidance document.

120-4 V Update to NCWM Bylaws based on Periodic Review

(This item was Adopted.)

Source:
NCWM Board of Directors (2016)

Purpose:
In accordance with NCWM policy, the Board of Directors has completed a review of the bylaws and provides these recommendations to more closely reflect the corporation in 2016.

Item under Consideration:
NOTE: This item presents only those sections of the bylaws where changes are being proposed. A complete copy of the bylaws is available for download at: **http://www.ncwm.net/about/bylaws**.

Amend NCWM Bylaws as follows:

Article I - General

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Section 5 - Relationship to the National Institute of Standards and Technology

The Corporation ~~**is in part self-supporting and in part sponsored by**~~**works in cooperation with** the Department of Commerce, National Institute of Standards and Technology (NIST) by means of a Memorandum of Understanding (MOU) ~~**developed**~~**established** between NIST and the Corporation. NIST ~~**sponsorship**~~**participation and support** is under the authority of that portion of the Organic Act (U.S. Code, Title 15, Chapter 7, Section 272) authorizing NIST to undertake "cooperation with the States in securing uniformity in weights and measures laws and methods of inspection."

As employees of the United States government, NIST staff are precluded by ethics laws, including sections 207-209 of Title 18 of the United States Code, from serving as officers, board members or employees of the Corporation.

~~The MOU referenced above establishes a joint project between the Corporation and NIST called "The National Conference on Weights and Measures."~~ The MOU **referenced above** also names the Director of NIST **as ~~the~~** Honorary President of **~~this~~the National** Conference **on Weights and Measures** and designates the Chief of the NIST Office of Weights and Measures as the Executive Secretary of the Conference. Under the MOU, on behalf of NIST, the Executive Secretary provides liaison between NIST and the Corporation; administers the NIST MOU and other cooperative agreements between NIST and the Corporation; advises the Corporation on technical and policy issues and oversees the Technical Advisors assigned to work with the various committees of the Conference; develops and does editorial review of publications of mutual interest ~~as defined in the MOU; and assists in planning the agenda for the meetings of the Conference~~.

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Article II - ~~Goals~~Mission

Section 1 - ~~Goals~~Mission

The mission of the National Conference on Weights and Measures, Inc. is to advance a healthy business and consumer climate through the development and implementation of uniform and equitable weights and measures standards using a consensus building process. ~~The goals of the National Conference on Weights and Measures, Inc., are:~~

A. ~~Enhance the National Conference on Weights and Measures, Inc., as a national and international resource for measurement standards development.~~

B. ~~Provide uniform training programs for industry and government individuals involved in legal metrology.~~

C. ~~Continue to develop new or alternative methods for improved delivery of weights and measures programs.~~

D. ~~Continue to expand the role of the Conference in national, and as a resource in international, legal metrology.~~

Section 2 - Regional Associations

The Corporation is a ~~National Conference~~ **national association** which ~~is associated and~~ has a close affiliation with four regional Weights and Measures Associations (Central, Northeastern, Southern and Western). The Corporation actively seeks representation from the four regions on its Board of Directors, standing and special purpose committees. The Corporation ~~as a corporation~~ has no legal connection with the four regional associations.

Article III - Membership

Section 1 - Types of Membership

Membership consists of three classes: active, advisory, and associate.

Active Membership
Applies to individuals in the employ of States, Commonwealths, Territories, or Possessions of the United States, their political subdivisions, the Navajo Nation, and the District of Columbia who are actively engaged in the enforcement of weights and measures laws and regulations.

Advisory Membership
Applies to (1) representatives of agencies of the Federal Government, (2) representatives of State and local governments other than those involved in the enforcement of weights and measures laws and regulations, (3) foreign government officials, and (4) retired persons who are interested in the objectives and activities of the Corporation ~~**and who**~~, participate as individuals rather than as representatives of a particular industry or interest group**, and meet the criteria in Article IV, Section 3 – Waiver of Registration and Membership Fees.**

Associate Membership
Applies to representatives of manufacturers, industry, business, and consumers, and other persons who are interested in the objectives and activities of the Corporation and who do not qualify as Active or Advisory member.

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Article IV - Membership Fees and Records

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Section 4 - Inspection of Records

All records of the Corporation shall be open for inspection or review **at the Corporation's discretion**, except records pertaining to the National Type Evaluation Program (NTEP) that are deemed proprietary by the NTEP Committee, providing a request for review is submitted to the Organization or individual responsible for maintaining such records. The inspection of the records shall take place at the offices of the Corporation at a reasonable time, under reasonable conditions, and under the supervision of the custodian of the records or an individual designated by the Board of Directors to supervise the review of the records. The Corporation may collect fees to recover costs.

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Article VIII - Meetings of the Corporation

Section 1 - Annual Meeting

The Annual Business Meeting of members shall be held at the annual meeting of the Corporation. Notice of the annual meeting shall be given. Notice shall be no less than 10 ~~**nor more than 60**~~ days before the date of the meeting, except that notice to act on an amendment to the Articles of Incorporation, a plan of merger, a proposed sale of assets or the dissolution of the Corporation shall be given not less than 25 ~~**nor more than 60**~~ days before the date of the meeting.

The agenda for this meeting shall include the election of the Board of Directors and reports from the Chairman and the Treasurer.

The Annual Technical Meeting shall also be held at the Annual meeting of the Corporation and may include reports from various committees, task forces, study groups, and other items pertinent to the Corporation, as well as the presentation of technical papers, discussions, displays, entertainment, or other events at the discretion of the Board of Directors.

Section 2 - Interim Meetings

The Interim Meetings of the Board of Directors and those Standing Committees designated by the Chairman shall be held annually, approximately 6 months prior to the Annual Meeting in order to develop the agenda and committee recommendations to be presented to and acted on by the membership at the Annual Meeting.

Section 3 - Special Meetings

A. The Corporation Chairman is authorized to order a meeting of the Board of Directors at any time such a session is deemed by the Chairman to be in the best interests of the Corporation. Such meeting may, at the discretion of the Chairman, take place in any manner technologically possible, including, but not limited to, telephone conference call and electronic mail. A quorum shall consist of 7 members of the Board. Voting may be cast in any manner prescribed by the Chairman.

B. Other Committees of the Corporation are authorized to hold meetings at times other than the Annual Meeting or Interim Meeting provided that:

   1. such meeting or meetings have been provided for in the Corporation budget approved by the Board of Directors, or

   2. such meeting or meetings are approved by the **Board of Directors in cases where funding is required.** ~~**Chairman and funding is available within the approved budget, or**~~

   ~~3.~~ ~~**such meeting or meetings are approved by the Chairman and the Board of Directors including agreement to increase the budget to cover the cost of the meeting.**~~

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Article IX - Committees

Section 3 - National Type Evaluation Program (NTEP) Committee

The NTEP Committee is comprised of five members: the Immediate Past Chairman, the Chairman and the Chair-Elect of the Conference and two regional Directors from the Board of Directors. The NTEP Committee must include at least one member from each of the four regions. The NTEP Administrator shall serve in an advisory role to the NTEP Committee.

The NTEP Committee may develop recommendations to the Board of Directors for the NTEP fees including, but not limited to application fees to obtain a NTEP Certificate of Conformance and the annual maintenance fee for retaining a NTEP Certificate of Conformance. The NTEP Committee is responsible for the operation of NTEP with respect to ~~**its fiscal management,**~~ providing guidance related to the activities of the program and establishing Publication 14 NTEP technical policy and procedures and recommending Publication 14 administrative policies to the board for approval.

The Chairman of the NTEP Committee makes appointments from the Advisory, Active, and Associate Members to the technical committees of the National Type Evaluation Program known as Sectors. The Associate members represent the interest of manufacturers, retail sales organizations, and users of commercial devices. The Active members represent the interest of government officials and the consumer. These Sectors make technical, policy, and procedural recommendations to the NTEP Committee for implementation.

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Section 5 - Duties and Fields of Operation of Committees

A. Laws and Regulations Committee

The Laws and Regulations Committee annually presents a report for Corporation action.

Its scope embraces all matters within the area of weights and measures supervision including:

1. the development and interpretation of uniform laws and regulations;
2. the study and analysis of bills for legislative enactment;
3. the establishment and maintenance of published guidelines and other effective means of encouraging uniformity of interpretation and application of weights and measures laws and regulations; and
4. liaison with Federal agencies, State agencies, and other groups or organizations on issues within the purview of the Committee. This role entails explaining, advocating, and coordinating Corporation positions, recommendations, and needs before Federal Government agencies, consumer groups, the associate NCWM membership, domestic and international standards organizations, industry, trade associations, and others. The goals are to provide and solicit information, develop a spirit of cooperation, and promote uniformity with the activities and standards of the NCWM.

B. Specifications and Tolerances Committee

The Specifications and Tolerances Committee annually presents a report for Corporation action.

Its scope embraces all matters dealing with:

1. specifications, tolerances, and technical requirements of any kind relating to scales, weights, measures, and weighing and measuring devices and accessories, including interpretation of such material whenever necessary,
2. standards and testing equipment for weights and measures officials,
3. procedures for testing commercial equipment, and
4. liaison with Federal agencies, State agencies, and other groups or organizations on issues within the purview of the Committee. This role entails explaining, advocating, and coordinating Corporation positions, recommendations, and needs before Federal Government agencies, consumer groups, the associate NCWM membership, domestic and international standards organizations, industry, trade associations, and others. The goals are to provide and solicit information, develop a spirit of cooperation, and promote uniformity with the activities and standards of the NCWM.

C. Professional Development Committee

The mission of the Committee is:

To provide leadership to develop and implement uniform, quality weights and measures services in the areas of:

1. effective program management,
2. education, and
3. public relations.

The Professional Development Committee annually presents a report for Corporation action.

The four main areas for focusing their efforts are:

1. **National Training ~~Program~~**

   The focus of the ~~N~~**n**ational ~~T~~**t**raining ~~**Program (NTP)**~~ is to increase technical knowledge, strengthen credibility, and improve the professionalism of the individual weights and measures official. ~~**A s**~~**S**trong ~~**NTP**~~**training programs** would promote uniformity across the nation.

~~2.~~ ~~**National Certification System**~~

~~**Develop a national certification system to recognize or accredit weights and measures programs as competent or capable. The program would include requirements around individual training, proper test standards, use of national handbooks, and a data gathering system.**~~

3. **National Certification**

National certification provides confidence that an individual has a strong understanding of U.S weights and measures standards as adopted by NCWM and published in NIST Handbooks 44, 130, and 133. The Committee oversees the development and ongoing improvement of professional certification.

4. **Conference Training Topics**

The Committee would be the focal point for gathering and recommending workshops or symposia on leadership, management, and emerging issues to be presented during the Annual Meeting. These topics would provide a forum for the exchange of ideas and discussion of changes in the marketplace.

5. **Uniformity of Data**

The Committee would develop standard categories for devices and inspection areas so that such things as the number of devices, compliance rates, frequency of inspection and other areas could be compiled and compared at the national level. These statistics could be used to benchmark organizations and to communicate the value of weights and measures to the public and to decision makers.

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Article X - Voting System

In the case of business issues relating to NCWM, Inc., as a Corporation, all questions before a meeting of the Corporation are to be decided by voice vote of members of all three houses.

Members of all three houses may speak to all issues on the floor, both business and technical issues. However, the adoption of final reports of committees on technical issues, as well as other technical issues, is to be decided by a formal recorded vote of the active members in accordance with the following voting structures and procedures. **The determination as to whether an issue is technical or business shall be made by the Board in accordance with the policies and procedures of the Corporation.**

Section 1 - House of State Representatives

A. Official Designation

This body of Active members who are officially designated by their States and are present and registered at the Annual Meeting shall be known as the "House of State Representatives."

~~**The House of State Representatives shall vote, as well as the House of Delegates, and the House of General Membership, on all business issues relating to NCWM, Inc., as a Corporation.**~~

~~**The House of Representatives and the House of Delegates alone will vote on all technical questions before the Corporation, including reports and recommendations of all of the Standing Committees (namely, the Specifications and Tolerances Committee, the Laws and Regulations Committee, and the Professional Development Committee) and the NTEP committee, as well as all other technical issues relating to weights and measures; technical handbooks; and legal metrology.**~~

B. Composition

Each State is authorized one official to serve as its representative at the Annual Meeting of the NCWM. The State weights and measures director, or his or her designee (State or local government official), is the State representative.

The District of Columbia, the Navajo Nation, and the U.S. Commonwealths and Territories that have weights and measures programs similar to those of the States (for example, have followed the uniform laws and regulations and have adopted Handbook 44) are also allowed representatives.

C. Method of Designation

Each representative is specified annually to the Credentials Committee 30 days before the NCWM Annual Meeting. Accommodation may be made for exceptions to this deadline. An alternate should be named prior to the NCWM Annual Meeting in case the designated representative cannot attend.

Section 2 - House of Delegates

Official Designation
All other Active members present and registered at the Annual Meeting (those not sitting in the House of State Representatives) are grouped as a body known as the "House of Delegates." ~~**The House of Delegates shall vote, as well as the House of Representatives and the House of General Membership, on all business issues relating to NCWM, Inc., as a Corporation.**~~

~~**The House of Delegates and the House of Representatives alone will vote on all technical questions before the Corporation. All members of the Corporation, including Associate Members, will vote on all business issues before the Corporation. The determination as to whether an issue is technical or business shall be made by the Board in accordance with the policies and procedures of the Corporation.**~~

Section 3 - House of General Membership

Official Designation
This body shall comprise Associate and Advisory members of NCWM, Inc., who are present and registered at the Annual Meeting. The House of General Membership shall vote, as well as the House of Representatives and the House of Delegates, on all business issues relating to NCWM, Inc., as a Corporation. ~~**The House of General Membership shall not vote on technical questions before the Corporation, which includes reports and recommendations of all of the Standing Committees (see Article IX, Section 2) and all other technical issues relating to weights and measures; technical handbooks; and legal metrology.**~~

Section 4 - Minimum Votes Needed for an Official Vote of a House <u>on Technical Items</u>

A. House of State Representatives

A minimum of 27 votes in favor of, or 27 votes in opposition to, an issue must be cast for the vote to be considered official. If 54 or more votes are cast in the House of State Representatives, a simple majority of the total votes is required to pass (or defeat) the issue.

B. House of Delegates

A minimum of 27 votes in favor of, or 27 votes in opposition to, an issue must be cast for the vote to be considered official. If more than 54 total votes are cast, a simple majority rules. Should a tie vote occur, or if the minimum votes in support or opposition are not cast, the issue is decided by the vote of the House of State Representatives.

Section 5 - Voting Rules

A. Quorum

A quorum shall consist of 27 eligible voting members in the House of State Representatives.

B. Proxy Votes

Proxy votes are not permitted. Since issues and recommendations in the committees' interim reports are often modified and amended at the NCWM Annual Meeting, the attendance of officials at the Annual Meeting and voting sessions is vital.

C. Method

For voting on business issues relating to NCWM, Inc. as a Corporation, all voting is by a voice vote of the members eligible to vote. For voting on the adoption of final reports of committees on technical issues, as well as for voting on all other issues, and in the event that the voice vote is too close to be determined in the opinion of the Chairman, there shall be a show of hands, standing vote, or machine (electronic) vote count. No abstentions are recorded.

D. Timing

Voting by all **eligible** Houses is simultaneous.

E. Recording

The voting system which shall be used, except in the case of a voice vote, is designed to record the vote **count of each houses ~~of voters~~**, whether an electronic system, show of hands, or standing vote is used.

F. Applicability

These procedures (rules) apply only to the plenary (general) sessions of the NCWM.

Section 6 - Committee Reports

Alternatives that may be used in voting on the reports:

A. vote on the entire report,

B. vote on grouped items or sections, or

C. vote on individual items; according to

1. committee discretion, or
2. on request by a registered attendee.

Section 7 - Amendments and Changes

A. Technical Items

1. **Changes**

   Committee chairmen may offer changes to their final reports on the day of voting.

2. **Amendments**

   Substantive amendments can be made at the request of weights and measures officials only, and:

   a. a majority of the voting delegates of the House of State Representatives and the House of Delegates must vote favorably before a proposed amendment can be accepted for debate.

   b. a two-thirds favorable vote of the House of State Representatives and the House of Delegates on the amendment is required for passage (the requirement for a minimum vote of 27 in each House also applies).

B. Business Items

1. **Changes**

   Committee or Board members may offer editorial changes to their final reports on the day of voting.

2. **Amendments**

   Substantive amendments can be made at the request of any member, and:

   a. a majority of the voting delegates of each House must vote favorably before a proposed amendment can be accepted for debate.

   b. a two-thirds favorable vote of each House on the amendment is required for passage (the requirement for a minimum vote of 27 in all three Houses also applies).

Section 8 - Seating

Arrangement
The seating arrangement for voting sessions is shown in the diagram following Article XI of these bylaws.

Supervision
The members of the Credentials Committee will count votes and control placement and movement of delegates.

Section 9A - Voting - Technical Issues

Only members of the House of Delegates and the House of Representatives will vote on technical questions before the Corporation. At the conclusion of debate (if authorized) on a motion, there shall be a call for the vote by voice vote, a show of hands, standing, or electronic count. The requirements for an official vote in a house are found in Article X, Section 4.

A. Motion Accepted If:

2. the House of State Representatives casts an official vote in favor of the item

   And

3. the House of Delegates casts an official vote in favor of the item or the House of Delegates fails to cast an official vote.

B. Motion Rejected If:

1. the House of State Representatives casts an official vote in opposition of the item

   And

2. the House of Delegates casts an official vote in opposition of the item or the House of Delegates fails to cast an official vote.

C. Issue Returned to Committee for Future Consideration If:

1. The House of Representatives fails to cast an official vote

   Or

2. An official vote is cast in each house but one house votes yea and the other house votes nay.

The issue cannot be recalled for another vote at the same Annual Meeting.

Voting on Technical Issues: The Two-House System

The vote by a house is "Official" if: The number of Yea votes is 27 or more
OR
The number of Nay votes is 27 or more

			House of Delegates				
			Majority Vote Yea		Majority Vote Nay		Tie Vote
			Official Vote (≥ 27)	Unofficial Vote (< 27)	Official Vote (≥ 27)	Unofficial Vote (< 27)	
House of State Representatives	Majority Vote Yea	Official Vote (≥ 27)	**Motion Accepted**	**Motion Accepted**	Returned to Committee	**Motion Accepted**	**Motion Accepted**
		Unofficial Vote (< 27)	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee
	Majority Vote Nay	Official Vote (≥ 27)	Returned to Committee	**Motion Rejected**	**Motion Rejected**	**Motion Rejected**	**Motion Rejected**
		Unofficial Vote (< 27)	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee
	Tie Vote		Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee

Section 9B -Voting - Business Issues

All members of the Corporation, including Associate Members, will vote on all business issues before the Corporation. At the conclusion of debate (if authorized) on a motion, there shall be a call for the vote by voice vote. In the event that a voice vote is too close to be determined in the opinion of the Chairman, there shall be a show of hands, standing vote, or machine (electronic) vote count. **There is no minimum voting requirement for any house for business issues.**

B. Motion Accepted If:

1. a majority of those members present and voting vote Yea.

C. Motion Rejected If:

1. a majority of those members present and voting vote Nay.

D. Tie Vote:

1. In the case of a tie vote, the vote of the Chairman shall prevail.

Background/Discussion:
In 2015, the Board of Directors adopted a policy that provides for periodic review of NCWM bylaws and policies on a five-year rotating basis. The initial review has taken place on the bylaws which has resulted in numerous recommended changes as presented in this item. In addition to the proposed changes in the Item under Consideration, there were many editorial corrections that had no material effect on the bylaws. The proposed changes in this item are a combination of housekeeping and updating them to be more reflective of the corporation as it exists today.

Bylaw amendments require a majority vote of all members present at the Annual Meeting.

120-5 V NCWM Bylaws, Article X, Sections 4 and 9A

(This item was adopted.)

Source:
Los Angeles County, California (2016)

Purpose:
Establish equity between the House of State Representatives and the House of Delegates in the voting process of NCWM in the event of highly-contentious matters under consideration for adoption of model national standards when attendance and participation are relatively high in each House and testimony and votes indicate the absence of clear consensus through tie votes in either House.

Item under Consideration:
Amend NCWM Bylaws as follows:

Section 4 – Minimum Votes Needed for an Official Vote of a House

A. House of State Representatives

A minimum of 27 votes in favor of, or 27 votes in opposition to, an issue must be cast for the vote to be considered official. If 54 or more votes are cast in the House of State Representatives, a simple majority of the total votes is required to pass (or defeat) the issue. **Should a tie vote occur, with 27 or more votes each in favor and opposition, the item neither passes nor fails and shall be addressed as set forth in Section 9A (C).**

B. House of Delegates

A minimum of 27 votes in favor of, or 27 votes in opposition to, an issue must be cast for the vote to be considered official. If ~~more than~~ 54 **or more** ~~total~~ votes are cast **in the House of Delegates**, a simple majority rules. ~~Should a tie vote occur, or i~~**I**f the minimum **27** votes in support or opposition are not cast, the issue is decided by the vote of the House of State Representatives. **Should a tie vote occur, with 27 or more votes each in favor and opposition, the item neither passes nor fails and shall be addressed as set forth in Section 9A (C).**

And

Section 9A - Voting - Technical Issues

At the conclusion of debate (if authorized) on a motion, there shall be a call for the vote by voice vote, a show of hands, standing, or electronic count. The requirements for an official vote in a house are found in Article X Section 4.

A. Motion Accepted If:

1. the House of State Representatives casts an official vote in favor of the item

And

2. the House of Delegates casts an official vote in favor of the item or the House of Delegates fails to cast an official vote

B. Motion Rejected If:

1. the House of State Representatives casts an official vote in opposition of the item

And

2. the House of Delegates casts an official vote in opposition of the item or the House of Delegates fails to cast an official vote

C. Split Vote: Issue Returned to Committee for Future Consideration If:

a. The House of Representatives fails to cast an official vote

Or

b. An official vote is cast in each house, but one house votes yea and the other house votes nay

c. Either the House of Representatives or House of Delegates casts a tie vote of 27 votes or more each in favor and in opposition to the item.

The issue cannot be recalled for another vote at the same Annual Meeting.

Voting on Technical Issues: The Two-House System

The vote by a house is "Official" if: The number of Yea votes is 27 or more

OR

The number of Nay votes is 27 or more

			House of Delegates					
			Majority Vote Yea		Majority Vote Nay		Tie Vote	
			Official Vote (≥ 27)	Unofficial Vote (< 27)	Official Vote (≥ 27)	Unofficial Vote (< 27)	**(< 54 total votes)**	**(≥ = 54 total votes)**
House of State Representatives	Majority Vote Yea	Official Vote (≥ 27)	**Motion Accepted**	**Motion Accepted**	Returned to Committee	**Motion Accepted**	**Motion Accepted**	**Returned to Committee**
		Unofficial Vote (< 27)	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	**Returned to Committee**
	Majority Vote Nay	Official Vote (≥ 27)	Returned to Committee	**Motion Rejected**	**Motion Rejected**	**Motion Rejected**	**Motion Rejected**	**Returned to Committee**
		Unofficial Vote (< 27)	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	**Returned to Committee**
	Tie Vote		Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	Returned to Committee	**Returned to Committee**

Background/Discussion:

Under current NCWM Bylaws regarding voting processes and pass/fail determinations pertaining to technical issues, a vote (an "official" vote with a minimum of 27 votes constituting a simple majority either in favor or opposed) of the House of State Representatives decides the issue if the vote of the House of Delegates results in a tie. As the voting actions of NCWM serve to establish model laws and regulations for the nation, the submitter believes that it is altogether appropriate that any item proposed as such a model law or regulation receive a majority vote in each House (either in support or opposition) before being published and presented for adoption by all states and jurisdictions throughout the Nation (or before being formally rejected from further consideration). The existing voting rules allow for the hypothetical result involving a 27 Aye/26 Nay vote in the House of Representatives overriding a 27 Aye/27 Nay vote in the House of Delegates, thus, establishing a national standard based upon a single deciding vote in the House of Representatives. The submitter asserts that no national standard should be adopted (or rejected) on such a miniscule margin in only one house of a dual-house system.

This proposal retains the ability for NCWM to pursue its business and accomplish critical decision-making in the event that the House of Delegates fails to assemble sufficient numbers of Conference attendees to provide the supporting (or opposing) votes to complement (or contradict) that of the House of State Representatives by requiring at least an equivalent minimum number of votes (27) as that required of the House of Representatives to decide an issue (i.e., to constitute an "official" vote). However, it also serves to address the potential inequity under a hypothetical attendance by, for instance, 100 Delegates who submit votes totaling 50 Aye and 50 Nay (a tie), in which case an official vote of the House of Representatives (which would never, realistically, exceed 27 or 28 votes as a simple majority in a very tight vote) would "decide the issue." The submitter believes it is arguably wrong, simply put, for 27 or 28 votes in one House to override 50 votes (under the hypothetical) in the second House to establish a national standard when the issue is so clearly controversial or uncertain as to result in a clearly divided vote amongst Weights and Measures Officials assembled from throughout the very nation for which a standard is sought.

A core goal of NCWM is to encourage attendance and participation of as many weights and measures officials and interested/affected industry members as possible to ensure that the broadest possible range of testimony and perspectives is submitted for consideration by all in attendance while engaged in standards development and adoption. The submitter argues that any voting structure that serves to subordinate or subjugate the influence of one House as opposed to another could serve to discourage attendance and participation (in this case, that of Delegates), which is not healthy for the NCWM or its mission. While that circumstance would continue to exist to some degree by virtue of the House of Representatives' ability to "decide the issue" in the event of insufficient votes from the House of Delegates to constitute an "official" vote, it is understandable that business must be enabled to proceed if Delegate attendance is diminished. However, if high numbers of Delegates and their respective jurisdictional administrators see fit to support the activities and endeavors of NCWM and financially support the travel, attendance, and participation of their Delegate representatives at NCWM conferences, that support should be recognized and respected through each House having comparable effect in the case of deciding the most hotly-debated issues to come before the Conference. This proposal provides for equal footing and influence by each House when the desired high-attendance is achieved and voting results indicate the absence of a clear consensus among all in attendance. At a minimum, a simple majority in an official vote of EACH House should be required to pass or defeat an item as a model national standard when sufficient attendance exists to accomplish such.

The submitter added the following comments for consideration: Circumstantial evidence in the form of informal comments as well as formal testimony (in regard to a number of highly contentious issues in recent years) has suggested that, in some cases, substantial efforts to influence votes of NCWM members were undertaken by interested stakeholders through lobbying efforts upon appointing authorities (State Governors, County Boards of Supervisors, elected officials at federal, state, and local levels, etc.) prior to the conduct of Annual Meetings of the Conference. While such actions can be reasonably anticipated regarding very contentious issues, the practice of securing votes through political influences devoid of the hearing of counter-arguments and contradictory evidence is disturbing and in stark contrast to the very fundamental purpose of NCWM – to provide the venue for receiving, considering, and debating evidence and perspectives and attempting to reach clear consensus on proposed items for adoption. Any practice of "counting heads" in the House of Representatives to secure, prior to Open Hearings and resulting discussions, a minimum 27 votes with only the need to effectively split a vote of the House of Delegates to reach a desired outcome serves to, potentially, make the entire system of NCWM moot and inconsequential regarding the very items NEEDING such open airing, debate, and thoughtful considerations. The simple requirement of a simple majority in each official vote of each House assures, at least, that appropriate and equitable support or rejection of a proposal exists before determination of a model national standard.

At the 2016 Annual Meeting, Mr. Kurt Floren spoke in support of this amendment, saying it is a matter of equity that 27 states should not prevail when there is a tie in the House of Delegates. Opposition was concerned that this amendment could further delay action unnecessarily when the majority of states support a proposal. It was also suggested that it is because of the unbalanced make-up of the House of Delegates there is an unbalanced authority of the houses.

130 FINANCIAL

130-1 I Financial Report

NCWM operates on a fiscal year of October 1 through September 30. Budgets are set to be conservative on projected revenues and realistic on anticipated expenses. In 2017, the Board is implementing a 10-year forecasting method to assist in the budgeting process.

The Board of Directors continues to monitor its ability to fully implement contingency plans based on potential costs compared to reserve funds.

The following is the balance sheet as of June 30, 2016, i*n comparison with the same time the previous year. Assets in the balance sheet are inflated by the NIST Training Initiative Grant that was awarded to NCWM. Those funds are earmarked for specific training activities. Assets are also inflated by the Associate Membership Fund. These funds are accumulated through the additional $15 dues paid by Associate Members and is spent at the discretion of the Associate Membership Committee (AMC) in accordance with Committee Bylaws.

ASSETS	**June 30, 2016**	**June 30, 2015**
Current Assets	$	$
Checking/Savings		
Associate Member Fund	29,542.91	30,386.05
NIST Training Grant	20,668.70	38,720.00
Certificates of Deposit	1,216,909.66	1,171,664.56
Checking	15,174.16	42,910.00
Savings	254,702.03	291,052.89
Total Checking/Savings	1,536,997.46	1,574,733.50
Accounts Receivable	-2,407.45	420.00
Other Current Assets	92,360.30	89,233.63
Other Assets	15,105.29	13,417.29
TOTAL ASSETS	**1,642,055.60**	**1,677,804.42**
LIABILITIES & EQUITY		
Liabilities		
Current Liabilities	39,333.45	33,451.35
Total Liabilities	39,333.45	33,451.35
Equity		
Designated - Associate Membership	29,542.91	30,386.05
Designated – NIST Training Grant	20,668.70	38,720.00
Unrestricted Net Assets	1,375,197.09	1,373,165.90
Net Income	180,313.45	202,081.12
Total Equity	1,602,722.15	1,644,353.07
TOTAL LIABILITIES & EQUITY	**1,642,055.60**	**1,677,804.42**

Mr. Jerry Buendel, Washington | Chairman
Ms. Kristin Macey, California | Chair-Elect
Mr. Ronald Hayes, Missouri | Immediate Past Chair
Mr. Raymond Johnson, New Mexico | Treasurer
Mr. Brett Gurney, Utah | Active Membership - Western
Mr. Craig VanBuren, Michigan | Active Membership - Central
Mr. Kenneth Ramsburg, Maryland | Active Membership - Southern
Mr. James Cassidy, City of Cambridge, Massachusetts | Active Membership - Northeastern
Mr. Chris Guay, Procter and Gamble | Associate Membership
Mr. Steve Giguere, Maine | At-Large
Mr. Chuck Corr, Archer Daniels Midland Co. | At-Large

Mr. Don Onwiler, NCWM | Executive Director
Ms. Georgia Harris, Acting Chief, NIST, OWM | Executive Secretary
Mr. Jim Truex, NCWM | NTEP Administrator
Mr. Carl Cotton, Measurement Canada | Board of Directors Advisor

Board of Directors

Appendix A

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

National Institute of Standards and Technology (NIST), Office of Weights and Measures (OWM)

INTRODUCTION

The OWM at NIST is responsible for coordinating United States participation in OIML and other international legal metrology organizations. Learn more about OIML at www.oiml.org and about NIST, OWM at www.nist.gov/owm. Dr. Charles Ehrlich, Program Leader of the International Legal Metrology Program, can be contacted at (301) 975-4834 by fax at (301) 975-8091 or charles.ehrlich@nist.gov.

Note: OIML publications are available electronically without cost at **www.oiml.org**.

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Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ANSI	American National Standards Institute	ISO	International Standardization Organization
APEC	Asia-Pacific Economic Cooperation	IWG	International Work Group
APLMF	Asia-Pacific Legal Metrology Forum	LMWG	Legal Metrology Work Group
APMP	Asia-Pacific Metrology Program	MAA	Mutual Acceptance Agreement
B	Basic Publication	MTL	Manufacturers' Testing Laboratory
BIML	International Bureau of Legal Metrology	NIST	National Institute of Standards and Technology
BIPM	International Bureau of Weights and Measures	NTEP	National Type Evaluation Program
CD	Committee Draft[1]	OIML	International Organization of Legal Metrology
CIML	International Committee of Legal Metrology	OWM	Office of Weights and Measures
CTT	Conformity to Type	PG	Project Group
D	Document	R	Recommendation
DD	Draft Document[2]	SC	Technical Subcommittee
DoMC	Declaration of Mutual Confidence	SIM	Inter-American Metrology System
DR	Draft Recommendation[2]	TC	Technical Committee
DV	Draft Vocabulary[3]	USNWG	U.S. National Work Group
GA	General Assembly	VIM	International Vocabulary of Metrology
IEC	International Electrotechnical Commission	VIML	International Vocabulary of Legal Metrology
IQ Mark	International Quantity Mark	WD	Working Draft[3]

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

[2] DD, DR, and DV: a draft document approved at the level of the technical committee, subcommittee or project group 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)

I. REPORT ON THE ACTIVITIES OF THE OIML TECHNICAL COMMITTEES

This section reports on recent activities and the status of work in the OIML Technical Committees (TCs), Technical Subcommittees (SCs), and Project Groups (PGs) of specific interest to members of the National Conference on Weights and Measures (NCWM). Schedules of future activities of the TC/SC Secretariats, PG Conveners, the U.S. National Work Groups (USNWGs), and the International Work Groups (IWGs) and Project Groups of the TCs and SCs are also included.

TC 3/SC 5 Conformity Assessment (United States)

The OIML Basic Publications B 3:2011 *Certificate System* and B 10:2012 *Mutual Acceptance Arrangement* (MAA) are the core documents underpinning the OIML Certificate System. An amendment to B 10 was approved by the CIML that allows for the voluntary use of test data from manufacturer's test laboratories (MTLs) under specially supervised conditions (NCWM has adopted the position that it will not accept test data under the MAA that was obtained from MTLs).

The OIML *Ad-Hoc* Working Group (AHWG) on the OIML Certificate System, consisting of interested CIML members, Committee on Participation Review (CPR) members, and representatives of manufacturers' associations, met twice in the first half of 2015. This working group was tasked with reviewing the structure, rules, and procedures governing the operation of the MAA (and the role of Utilizing Participants), with a view to increasing the efficiency of the operation of the MAA, and, if necessary, amending their internal (MAA) documents and suggesting to TC 3/SC 5 appropriate amendments to OIML Publication B 10. This *Ad-Hoc* Working Group was chaired by the CIML first Vice-President Dr. Roman Schwartz of PTB (Germany).

The AHWG has developed a proposal that could significantly change the way that the OIML Certificate System is structured, managed and operated. This proposal includes the creation of an OIML Certification System (called OIML-CS) that would be managed by a Management Committee instead of by the BIML. Advisory Committees to the Management Committee are also envisioned. The AHWG put this proposal forward to the CIML at its meeting in Arachon, France, in October 2015, where it was approved. The AHWG was then disbanded, and a new certification system project group (CSPG) was established that has prepared a draft of a proposed new framework document establishing the OIML-CS, for voting on at the 2016 CIML Meeting (in Strasbourg, France). This Project Group, also chaired by Dr. Schwartz, is working on an *ad-hoc* basis, and not under the rules of the OIML Directives, or under TC 3/SC 5. Operational documents for the Management Committee are being prepared but have not yet been circulated to the full CSPG for review. The CSPG is striving to begin implementation of the OIML-CS in January 2018.

Until the new OIML-CS is approved by the CIML, the current Basic and MAA systems will continue and will be supported by the BIML.

A meeting of the CPR was held in March 2016 in Denmark; the United States was represented at the meeting by Mr. Darrell Flocken (NCWM, NTEP), Dr. Charles Ehrlich (NIST, OWM), and Mr. John Barton (NIST, OWM).

The preliminary ballot of a new OIML document entitled *The Role of Measurement Uncertainty in Conformity Assessment Decisions in Legal Metrology* was distributed for CIML vote and comment in July 2015, with votes and comments due in October 2015. Although the vote passed, there were conflicting comments for which a proposed solution has been developed. The CIML will vote at its 2016 meeting on whether to issue this document as an OIML Guide, rather than a Document, to give the user community, the necessary time to consider how to incorporate it into OIML Recommendations. If there are any questions or for more information, please contact Dr. Ehrlich at (301) 975-4834 or **charles.ehrlich@nist.gov**. Please also see the MAA section in the National Type Evaluation Program (NTEP) Committee Report of this publication for more details on the activities of TC 3/SC 5.

TC 5/SC 1 Environmental Conditions (Netherlands)

OIML D 11 *General requirements for measuring instruments - Environmental conditions* has been published. This is a very important document in the OIML system and is used by all the OIML TCs as a general reference for technical and testing requirements on all measuring instruments. Highlights of this recent revision cycle include: expanding the terminology section, updating several testing sections to reflect the latest International Electrotechnical Commission (IEC) reference standards, and including a new environmental class (E3) for a non-mains local source of electrical power supply. Please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov, if you would like additional information on TC 5/SC 1 or OIML D 11.

TC 5/SC 2 Software (Germany and BIML)

The OIML D 31 *General Requirements for Software-controlled Measuring Instruments* has been published and now serves as guidance for software requirements in International Recommendations by OIML TCs. 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 approved by the CIML, and the United States is waiting for the first draft of this document. Please contact Dr. Ambler Thompson at (301) 975-2333 or ambler@nist.gov if you would like to discuss OIML software efforts.

TC 6 Prepackaged Products (South Africa)

The first draft of a new project *Guidance for defining the system requirements for a certification system for prepackages* was discussed at a TC 6 meeting in Seoul, South Korea, in September 2014. This guideline is being developed to assist countries in establishing reciprocal agreements to accept the test results on prepackaged goods. It is expected that the 2 CD of this guidance document will be distributed soon.

A revision of OIML Recommendation R 87 *Quantity of Product in Prepackages* (the OIML equivalent to NIST Handbook 133: *Checking the Net Contents of Packaged Goods*) includes a comprehensive overhaul of the statistical requirements and sampling plans (the revisions were prepared by Blaza Toman of NIST's Statistical Engineering Division) to correct errors discovered by a statistician from Asia a few years ago. The United States and several other countries were successful in opposing efforts by several European Union countries to add drained weight test procedures and packaging requirements utilized in that region to the new edition of R 87. Those procedures were rejected primarily because they failed to recognize drained weight test methods that have been in use around the world for decades and which have been adopted by Codex Alimentarius. The preliminary ballot of R 87 passed in September 2015. A sufficient majority of CIML Members supported the Draft Recommendation, but it was decided that two issues concerning sample sizes and the statistical requirements for sampling needed to be resolved before the Final Draft Recommendation could be submitted to the CIML for final approval. The project group held a meeting in Rio de Janeiro, Brazil, in January 2016 and resolved the statistical issues. It is anticipated that R 87 will receive final CIML approval in October 2016.

OIML R 79 *Labeling Requirements for Prepackaged Products* received final CIML approval in October 2015 and has now been published. The United States voted "yes" on both the CIML preliminary ballot in June 2015 and the final Draft Recommendation.

For more information on the activities of this committee, and to participate in the U.S. review of these documents, please contact Mr. Ken Butcher at (301) 975-4859 or kbutcher@nist.gov .

TC 8 Measurement of Quantities of Fluids (Japan)

Based on responses received on a questionnaire concerning several projects in TC 8, Japan decided to cancel a project to combine and revise R 40, R 41 and R 43 into a single standard entitled *Standard volumetric measures.* Japan also decided to delay the project to revise R 63 *Petroleum Measurement Tables* (1994) until the corresponding ISO standard is next revised. The Secretariat plans to start the revision of R 119 *Pipe Provers for Testing of Measuring*

Systems for Liquids Other Than Water (1996) – this document is important for other OIML recommendations involving liquid measurement. Please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov, if you would like copies of any of these documents or to participate in the project to revise R 119.

TC 8/SC 1 Static Volume and Mass Measurement (Germany)

The United States chairs the Project Group that has drafted new sections of OIML R 71 *Fixed Storage Tanks* and R 85 *Automatic Level Gages for Measuring the Level of Liquid in Fixed Storage Tanks* to add specific requirements for specialized tanks. The 1 CD of R 71 and R 85 were distributed for project group comment in March 2016. The 2 CD of OIML R 80-2, *Road and Rail Tankers, Test Methods* was distributed in April 2016. The Secretariat has also initiated the effort of revising OIML R 95 *Ships' Tanks*. A meeting to discuss these TC 8/SC 1 projects is scheduled for June 2016 in Gothenburg, Sweden. Please contact Mr. Ralph Richter at (301) 975-3997 or 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)

The CIML has approved a new project for an "immediate revision" of all three parts of R 117 *Dynamic Measuring Systems for Liquids Other Than Water*. This new project will fully harmonize all three parts and add new annexes to R 117 for several complete measuring systems, including: (a) measuring systems for the unloading of ships' tanks and for rail and road tankers using an intermediate tank, (b) measuring systems for liquefied gases under pressure (other than LPG dispensers), (c) measuring systems for bunker fuel, and (d) measuring systems for liquefied natural gas (LNG). The 1 CD of R 117 was distributed in April 2016, and there is an R 117 project group meeting that is scheduled to be held in Delft, The Netherlands in July 2016. If you have any questions or would like to participate in this project, please contact Mr. Ralph Richter at (301) 975-3997 or **ralph.richter@nist.gov**.

TC 8/SC 6 Measurement of Cryogenic Liquids (United States)

The Secretariat for R 81, *Dynamic Measuring Devices and Systems for Cryogenic Liquids* distributed a first working draft (1WD) of R 81 to TC 8/SC 6 members and the USNWG for their review and comment. Nine members of the R 81 project group submitted comments on Parts 1 and 2 of R 81. A compilation of those comments will be distributed in mid-2016, and distribution of a first committee draft incorporating these comments is also planned for mid-2016. 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)

All three parts of OIML R 137 *Gas Meters* have been published. Extensive United States comments on the 1 CD, the 2 CD, and the DR were developed in cooperation with the measurement committees of the American Gas Association. The OIML R 137 document is especially important to the U.S. interests because the American National Standards Institute (ANSI) B 109 committee on gas measurement is using the published R 137 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 participate in these efforts or if you would like to obtain a copy of any of these gas measurement documents.

All three parts of OIML R 139, *Compressed gaseous fuel measuring systems for vehicles,* have now been published. This standard is important to U.S. stakeholders, especially in the effort to maximize harmonization between domestic and international legal metrology requirements used for the delivery of alternative fuels such as hydrogen gas and compressed natural gas (CNG). To obtain more information on this effort, please contact Ms. Juana Williams at (301) 975-3989 or juana.williams@nist.gov.

TC 9 Instruments for Measuring Mass (United States)

The United States distributed the 4th Committee Draft of R 60-1 *Metrological Regulation for Load Cells* Parts 1 and 2 (Metrological and technical requirements and Metrological controls and performance tests) in November 2015 for comments and voting. Along with the 4 CD of R 60-1, the 1 WD (Working Draft) of R 60-2 was circulated among the TC 9/p1 members for review in November 2015. Voting on the 4 CD of R 60-1 indicated the need for a 5 CD to be developed based upon comments from the project group. Comments received on the 1 WD of R 60-2 will be used to develop a 1 CD, R 60-1, 5 CD and R 60-2, 1 CD are expected to be circulated to TC 9/p1 members during the summer of 2016. For more information on TC 9 activities, please contact Mr. John Barton at (301) 975-4002 or **john.barton@nist.gov**.

TC 9/SC 1 Non-Automatic Weighing Instruments (Germany and France)

Although no project has yet been formally started, the results of a 2015 questionnaire indicated that a majority of TC 8/SC 1 members wanted to initiate the revision process for OIML R 76:2006 *Non-automatic weighing instruments*.

TC 9/SC 2 Automatic Weighing Instruments (United Kingdom)

All three parts of OIML R 50 *Continuous Totalizing Automatic Weighing Instruments* (Belt Weighers) received final CIML approval in November 2014, and R 50 was published in March 2015. To receive copies of these documents or to obtain more information on the work of this subcommittee, please contact Mr. John Barton at (301) 975-4002 or **john.barton@nist.gov**.

The TC 9/SC 2 Secretariat distributed a questionnaire concerning a possible project to revise OIML R 51 *Automatic catch-weighing instruments,* which was last revised in 2006. The proposed international effort to revise R 51 was also announced by the NCWM. Please contact Mr. Rick Harshman at (301) 975-8107 or **richard.harshman@nist.gov** if you are interested in the project to revise this document.

TC 17/SC 1 Humidity (China and United States)

The 7 CD of OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* was distributed for voting in December 2014. Voting was conducted using the new OIML on-line voting for project groups and officially closed in April 2015. The 7 CD was approved by the project group with a total of 8 "yes" votes and 1 "no" vote. Comments received on the 7 CD were considered and the document was to be forwarded as a DR to the CIML for preliminary ballot voting. This voting will close in July 2016. Please contact Ms. G. Diane Lee at (301) 975-4405 or **diane.lee@nist.gov** if you would like to participate in this work.

TC 17/SC 8 Quality Analysis of Agricultural Products (Australia)

The 5 CD of a draft document *Measuring Instruments for Protein Determination in Grains* was circulated for vote in 2014. The United States voted "yes" on the 5 CD of this draft document in December 2014. Preliminary ballot voting on the DR closed in November 2015. The United States submitted a "no" vote with some significant comments on the DR based on the non-uniformity with the testing requirements in OIML R 59. The preliminary ballot passed (with 20 "yes" votes and only two "no votes), and it is expected that this new document will receive final CIML approval in October 2016. Please contact Ms. G. Diane Lee at (301) 975-4405 or **diane.lee@nist.gov**, if you would like to participate in this work.

OIML Mutual Acceptance Arrangement (MAA)

The report on the OIML MAA can be found in the TC 3/SC 5 report above and in the NTEP section of this document. For further information on the MAA and its implementation, please contact Dr. Charles Ehrlich at (301) 975-4834 or e-mail charles.ehrlich@nist.gov.

II. REPORT ON THE 50TH CIML MEETING IN ARCACHON, FRANCE IN OCTOBER 2015

Mr. Peter Mason, CIML member from the United Kingdom and President of the CIML, opened the meeting and gave the President's Report.

Mr. Stephen Patoray, who has been serving as BIML Director since January 2011, provided several reports on financial and administrative matters at the BIML, including improvements that have been implemented since his arrival at the BIML. Mr. Patoray also discussed several upgrades to the OIML website.

The CIML decided to renew the appointment of the BIML Director for a three-year term starting in January 2016. The Committee also expressed its expectation that it plans to renew the appointment of Mr. Willem Kool as BIML Assistant Director for a fixed term of up to five years at its meeting in 2016.

The Committee noted an oral report given by the BIML on its activities in liaison with other international organizations aimed at developing countries. The Committee also noted the report of an advisory group that was established to carry out wide consultation, to seek suggestions and to build up links with other bodies with an interest in promoting the economic development of countries and economies with emerging metrology systems.

The CIML, recognizing the continued efforts needed to assist in building the capacity of legal metrology institutions and their staff in countries and economies with emerging metrology systems (CEEMS), instructed the Bureau to (1) continue its efforts to participate in capacity building activities through training courses and other regional activities organized by other organizations, and (2) further develop the OIML website such that it may be used as a source of up-to-date information on capacity-building initiatives, including training materials and, if feasible, a database of experts available to contribute to such work. The CIML also requested relevant Technical Committees and Subcommittees to take note of the demand from CEEMS to ensure Recommendations take more account of the needs of CEEMS.

The Committee approved the following draft publications:

- Recommendation: OIML R 139-3 *Compressed gaseous fuels measuring systems for vehicles - Part 3: Test report format*;
- Revision of OIML R 79: *Labeling requirements for prepackages*; and
- New Recommendation: *Ophthalmic instruments - Impression and applanation tonometers*.

The Committee approved two new projects in TC 8/SC 1 Static volume and mass measurement:

- the revision of R 71 *Fixed storage tanks ─ General requirements*; and
- the revision of R 85 *Automatic level gauges for measuring the level of liquid in stationary storage tanks.*

The United States will serve as the convener on these two projects.

The Committee also approved a new project, the revision of OIML B 6:2013 *Directives for OIML technical work* to be conducted in an *Ad-hoc* Working Group.

The OIML *Ad-Hoc* Working Group (AHWG) on the OIML Certificate System explained their proposal that could significantly change the way that the OIML Certificate System is structured, managed and operated. This proposal includes the creation of an OIML Certification System (called OIML-CS) that would be managed by a Management Committee instead of by the BIML. Advisory Committees to the Management Committee are also envisioned. The AHWG put this proposal forward to the CIML in Arachon, and it was approved. The AHWG was then disbanded, and a new certification system project group (CSPG) was established that will prepare drafts of the proposed new documents establishing the OIML-CS, for voting on at the 2016 CIML Meeting. This Project Group, chaired by Dr. Schwartz (CIML First Vice-president), will work on an *ad-hoc* basis, and not under TC 3/SC 5.

Until the new OIML-CS is approved by the CIML, the current Basic and MAA systems will continue and will be supported by the BIML.

The Committee congratulated this year's recipients of an OIML Medal:

- Mr. Ngo Quy Viet, Vietnam, and
- Mr. Cartaxo Reis, Portugal.

III. FUTURE OIML MEETINGS

The 51st CIML Meeting and the 15th OIML Conference (held once every four years) will be held the week of October 17 - 21, 2016, in Strasbourg, France.

IV. REGIONAL LEGAL METROLOGY ORGANIZATIONS

A meeting of the Inter-American Metrology System (SIM) General Assembly is organized annually and is the event where delegates from National Metrology Institutes of the Americas meet to discuss important issues. The past two years, the SIM General Assembly was held in in Bogotá, Columbia, (November 2014) and Punta Cana, Dominican Republic (October 2015). Mr. José Dajes Castro, from INDECOPI in Lima, Peru, serves as the SIM President. The Legal Metrology Working Group is chaired by Mr. Emilio Löbbe from INTI/Argentina. The organization is working to build capacity in legal metrology for SIM member countries. In April 2015, INTI hosted a three-day course on "Assessment and Acceptance of Electrical Energy Meter Type Approval Certificates" in Buenos Aires, Argentina, as part of a regional project on "Quality Infrastructure for Energy Efficiency and Renewable Energy Sources in Latin American and the Caribbean." Also in April 2015, SIM held a workshop on "truck scales" and "modular verification" (load cells and digital indicators) in Panama City, Panama. Please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov for more information on SIM.

The 22nd Meeting of the Asia-Pacific Legal Metrology Forum (APLMF) was hosted by the United States and was held in Honolulu, Hawaii. The People's Republic of China has held the Presidency and Secretariat of APLMF for several years. Mr. Changcheng, APLMF President and Vice Minister of AQSIQ, chaired the meeting. At the end of the meeting, New Zealand assumed the APLMF Secretariat, and Mr. Stephen O'Brien of New Zealand's Ministry of Business, Innovation and Employment (MBIE) assumed the Presidency of APLMF.

The main objectives of APLMF are to coordinate regional training courses in legal metrology and to provide a forum for exchange of information among legal metrology authorities. APLMF activities are facilitated through its seven work groups. The most active WG is the Working Group on Training Coordination, chaired by Australia. In 2015, APLMF held the following training courses:

Course	Venue/Host	Trainers	Delivery Dates
Pre-packaged goods	Bandung, Indonesia	New Zealand	May 18 - 22, 2015
Verification of Fuel Dispensers	Pattaya City, Thailand	Australia	June 15 -19, 2015
Verification of Taxi Meters	Shanghai, China	China	July 07 - 10, 2015
Verification of CNG Dispensers	Kuala Lumpur, Malaysia	Malaysia	Aug 18 - 2,1 2015
Verification of Rice Moisture	Phnom Penh, Cambodia	Japan	Nov 16 - 20, 2015

The results of a recent APLMF survey clearly indicated that the more than 20 courses conducted by APLMF in the 2005 - 2013 time period were highly valued by the member economies, promoted harmonization in the Asia-Pacific region and frequently led to revised/improved legislation and regulations in the member economies.

A significant joint project entitled "Metrology Enabling Developing Economies in Asia" (MEDEA) has been launched by APLMF, the Asia Pacific Metrology Programme (APMP) and the Physikalisch-Technische Bundesanstalt (PTB). This four-year project is being managed by PTB and is primarily funded by Germany. The project aims to foster and further develop the capabilities of the APLMF and the Asia-Pacific Metrology Program (APMP) to support developing economies in the Asia-Pacific region, to promote metrology systems within developing economies, and to strengthen the metrology systems/infrastructure within developing economies. Several more training courses are planned through the MEDEA Project for the years 2016 to 2017.

The United States was represented at the APLMF meeting in Honolulu, Hawaii, by Ms. Carol Hockert, Chief of the Office of Weights and Measures (NIST), Mr. Jerry Buendel of the Washington State Department of Agriculture (current Chairman of the National Conference on Weights and Measures (NCWM), Ms. Jeri Kahana, Administrator of Weights and Measures for the State of Hawaii, Mr. Dmitri Karimov of IDEX/Liquid Controls (current Chair of the Meter Manufacturers Association), Dr. Charles Ehrlich, and Mr. Ralph Richter. The U.S. Scale Manufacturers Association (SMA) hosted the Welcome Dinner. Dr. Ehrlich serves as the Chair of the APLMF work group on Mutual Recognition Arrangements and gave a report and update on the OIML MAA. Mr. Richter presented the United States Country Report.

Japan is scheduled to host the next APLMF meeting in Tokyo in November 2016. Please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov for more information on APLMF and the 2016 APLMF Annual Meeting.

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Appendix B
Associate Membership Committee (AMC)
Agenda and Annual Meeting Minutes

David Calix, Chair
NCR

Table A
Table of Contents

AGENDA

I. Call to Order
II. Approval of Meeting Minutes
III. Financial Condition
IV. NCWM Industry Representative Reports
    (a) Board of Directors Report
    (b) Professional Development Committee Report
    (c) Laws and Regulations Committee Report
V. AMC Fund Disbursement Requests
VI. Filling Vacant Positions
VII. Old Business
VIII. New Business
IX. Adjournment

Associate Membership Committee (AMC)
Annual Meeting Minutes

July 26, 2016
Denver, CO

Call to Order
The meeting was called to order at 5:00 p.m. by the AMC Chairman, Mr. David Calix.

Meeting Minutes
The minutes from the previous AMC meeting were unanimously approved.

Financial Condition
A copy of the financial report for fiscal year to date October 15, 2015, to July 12, 2016, was distributed to the group. Favorable comments were received regarding the new format of the report, which is much easier to read and understand.

AMC Account Balance	$25,967.91
Pending Payments	9,557.00
Available Funds	$16,410.91

The financial report was unanimously approved.

Board of Directors Report
Mr. Chris Guay, the AMC representative on NCWM Board of Directors, gave a report regarding Board activities:

WEST
Budget issues in Alaska continue.
Arizona Weights and Measures program moved to Department of Agriculture.
Hawaii will be hosting WWMA (week of September 11, 2016) in Honolulu, Hawaii.
California received funding for the alternative fuel labs.

SOUTH
Mississippi looking for online testing of inspectors.
Kentucky is losing inspectors due to retirement and budget.
Southern Weights and Measures meeting will be in Arlington, Texas, and not Fort Worth.

NORTHEAST
Connecticut is establishing programs on electric and fuel cell vehicles and propane fuel.
Mr. Steve Giguere now Acting Director in Maine, doing rulemaking to adopt NIST Handbook 133, "Checking the Net Content of Packaged Goods" procedures.
Pennsylvania is in their first year of a fuel quality program.
Vermont is still getting their lab back and running after the flood several years ago.
Interim Meeting is in Portsmouth, New Hampshire at end of October.

CENTRAL
Indiana's metrologist left and the lab is down until new people are trained.
Iowa's lab is still not open and using other state labs.
Michigan received full funding to add inspectors and equipment.
Skimmers are being placed Friday nights and Saturdays and picked up Sundays.
Interim Meeting is in St Charles, Missouri, the first week of October.

NIST

Mr. Doug Olson (new Chief of NIST, Office of Weights and Measures) will be here Monday night and Tuesday. Georgia Harris will be the Acting Chief until February.
Training – doing more webinars especially for metrology; including support for Latin America.
Packaging and Labeling NIST Handbook 133 training for 105 people this year (weight and volume).
Doing first count, length, width NIST Handbook 133, class later this year in California.
Compressed Natural Gas (CNG) testing school this fall in Utah.
Train the Trainer Program has worked well to provide assistance to NIST trainers and as a supplement to the NIST training.
Questions remain on the official status of classes taught by non-NIST instructors.

Board Items of Interest
Membership currently somewhat stable.
Board has agreed to send Mr. Darrell Flocken and Mr. Don Onwiler to InterWeighing Expo in China which occurs every two years.

Upcoming Meetings:

- San Antonio, Texas, NCWM Interim meeting in January 2017.
- Pittsburgh, Pennsylvania, NCWM Annual meeting July 2017.

PALS/FALS Subcommittee Issues Under Discussion:

- Reporting of votes within the Subcommittee.
- Management of issues between Standing Committee and Subcommittee.

Charter Team Phase 1 and movement to Phase 2:

- Phase 1 report.
- Plan to Move into Phase 2.

Tool Kit Task Group (videos developed and under development).

Posting of Employment Opportunities on NCWM website:

- Positions can be posted by a NCWM member;
- Can be accessed by NCWM and non-NCWM members.

Professional Development Committee (PDC)
Mr. Richard Shipman, the PDC representative on the Committee reported on the activity of the PDC.

- Working on competency exams. The Committee is seeking input from the states.
- The PDC expressed appreciation to the Board for the support received by the AMC for training funds
- Ms. Julie Quinn has a very nice presentation on safety related to service. She expressed the need for input from industry.
- There will be two positions opening on the Committee.

Laws and Regulations (L&R) Committee Report
Ms. Rebecca Richardson, the AMC representative on the L&R Committee, reported on the activity of the L&R.

- Finished the agenda work today.
- Ms. Ha Dang stepped down. Ms. Michele Wilson will take her place through 2019.

AMC Fund Disbursement Report

Pending	Toolkit Task Group	$4,275.00
Pending	Virginia: SMAP	$2,300.00
Pending	NH - NEMAP	$872.00
Pending	Virginia: Safety	$500.00
Pending	Texas: SWAP	$1,060.00
Approved	NYS	$3,750.00
Approved	CNMI	$6,900.00

Filling Vacant Positions
There are three positions to fill on the AMC. The three officers and two Committee members.

OFFICE	NAME	AFFILIATION	TERM ENDS
Committee Chair	David Calix	NCR Corporation	2016
Vice-Chair	Richard Shipman	Rice Lake Weighing Systems, Inc.	2016
Secretary/Treasurer	Bill Callaway	Crompco	2016
Member	Richard Shipman	Rice Lake Weighing Systems, Inc.	2020
Member	Steven Grabski	Walmart Stores, Inc.	2020
Member	Christopher Guay	Procter and Gamble, Co.	2020
Member	Mark Flint	ADM	2020
Member	Rebecca Richardson	Marc – IV Consulting	2020
Member	David Calix	NCR Corporation	2018
Member	Bill Callaway	Crompco	2018
Member	Robert Murnane, Jr.	Seraphin Test Measure	2018
Member	Paul A. Lewis, Sr.	Rice Lake Weighing Systems, Inc.	2019

The open positions will be filled as follows:
Committee Chair – Richard Shipman, Rice Lake Weighing Systems will move up form Vice Chair to Committee Chair.
Vice Chair – Bill Callaway, Crompco, will move into the Vice Chair from Secretary.
Secretary/Treasurer – Mark Flint, ADM

Old Business
None.

New Business
BOD developing processes to speed up the change procedures. An improvement group was formed. Phase I – Shorter commitment. Phase II – Could be longer commitment. A Six sigma or Lean approach to be used.

The AMC policy on funds distribution is located on the NCWM website and has not been reviewed in seven years. This item is to be placed on the agenda for the next meeting.

Discussion on industry involvement. The question was raised on how do we get more industry involvement – not just when there is an item on the NCWM agenda that affects that industry (being pro-active vs. re-active). This topic will be added to the next meeting agenda.

Adjournment
With no further new business, Chair Calix adjourned the meeting at 6:25 p.m.

Respectfully submitted by,
Mr. Richard Shipman
Vice Chairman

Individuals in Attendance
Mr. Richard Shipman, Rice Lake Weighing Systems
Mr. Chris Guay, Proctor & Gamble
Mr. Paul Lewis Sr., Rice Lake Weighing Systems
Mr. Bob Murnane, Seraphin
Mr. Russel Vires, Mettler Toledo
Mr. David Calix, NCR
Mr. Henry Oppermann, W&M Consulting
Ms. Rebecca Richardson, Marc-IV Consulting / National Biodiesel Board
Mr. Richard Suiter, Richard Suiter Consulting LLC
Mr. Mark Flint, ADM
Mr. Jim Hewston, J.A. King
Mr. John Hughes, Rice Lake Weighing System
Mr. Jerry Buendel, NCWM Chair
Mr. Brett Gurney, Utah Dept. of Agriculture, Weights and Measures
Mr. Marc Buttler, Emerson
Mr. Don Onwiler, NCWM
Mr. Louis Straub, Fairbanks
Mr. Ron Gibson, Seraphin
Mr. Mike Kunselman, CQA
Mr. Mark Flint, ADM
Mr. Henry Kellogg, Campucom

Appendix C
Report of Team Charter to the Chairman
National Conference on Weights and Measures

July 2016

In recent years, concerns have been raised over the ability of the National Conference on Weights and Measures (NCWM) to accept, review, and pass or reject items that appear on its Committee's agenda in a timely manner. Team Charter was asked to assess the current status of standards development in NCWM and identify areas that are problematic. The following report includes a brief overview of the existing standards process and provides examples of recent items that appeared on the agendas of the NCWM Committees and outlines areas where changes are needed.

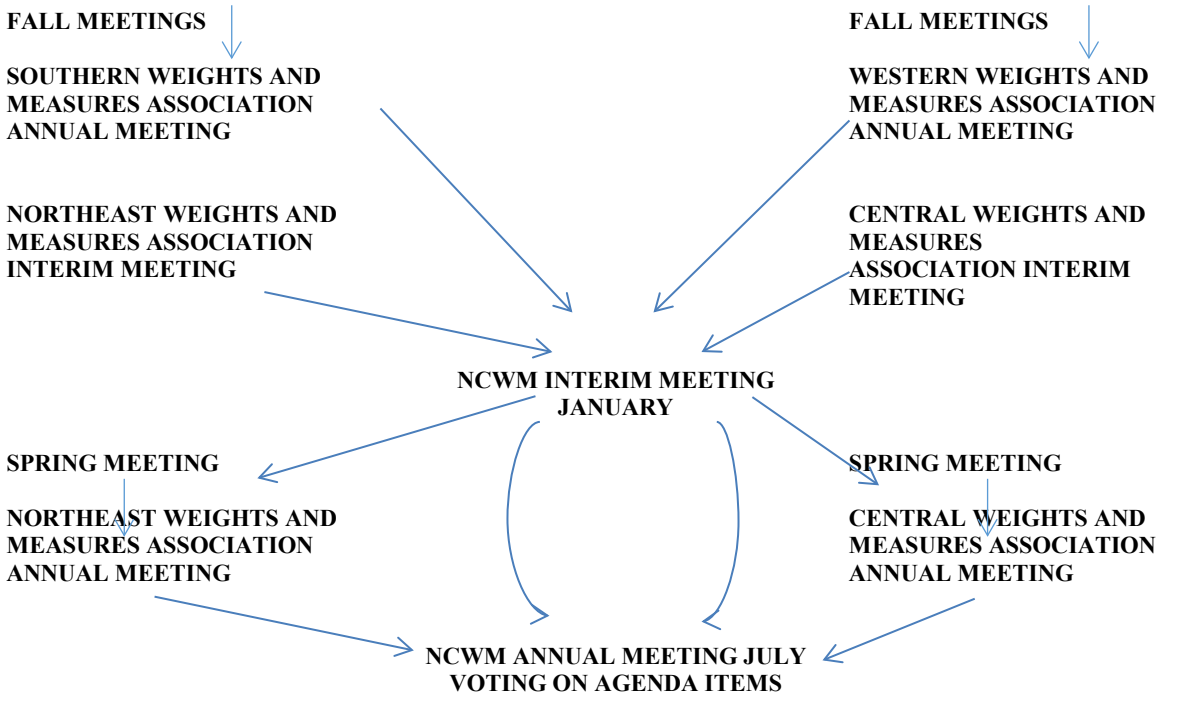
The report also identifies other standards groups whose workings may provide valuable information to Team Charter as its work progresses. Also identified are the participants in NCWM, as well as end users of the work product of NCWM.

NCWM's internal structure includes a Board of Directors, Standing Committees, Special Purpose Committees, the National Type Evaluation Program Committee, and Ad Hoc Committees, Subcommittees, Task Forces, and Study Groups.

The Standing Committees of NCWM are the Committee on Specifications and Tolerances, the Committee on Laws and Regulations, and the Professional Development Committee. The final work product of the standing committees is published in NIST Handbook 44, NIST Handbook 130 and NIST Handbook 133.

Interested parties wishing to present an item (proposal) to the National Conference on Weights and Measures must follow the guidelines described in NCWM's Bylaws, Policies and Rules. Items of a technical nature are assigned to a Sanding Committee and then included as an agenda item at both the regional and national levels. Agenda items are reviewed and discussed at the regional and national level and then either presented as a voting item or removed from an agenda.

NCWM – THE "MEETING FLOW" OF AGENDA ITEMS AS THEY MOVE FROM REGIONAL MEETINGS TO NATIONAL MEETINGS



Other National and International Standards Setting Groups:

Studying the methodology of standards setting used by other standards setting organizations will assist Team Charter in addressing the concerns raised in phase 1 of the report.

American Society for Testing and Materials (ASTM) **https://www.astm.org/**

> ASTM International is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

Society of Automotive Engineers (SAE) **http://www.sae.org/**

> SAE International, initially established as the Society of Automotive Engineers, is a U.S.-based, globally active professional association and standards organization for engineering professionals in various industries.

International Standards Organization (ISO) **http://www.iso.org/iso/home.html**

> The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. The organization promotes worldwide proprietary, industrial and commercial standards.

National Institute of Standards and Technology (NIST) **http://www.nist.gov/**

> NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

The American National Standards Institute (ANSI) **https://www.ansi.org/**

ANSI oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States.

Underwriters Laboratories (UL) **http://ulstandards.ul.com/**

UL is a product safety testing, certification and standards development organization.

National Fire Protection Association (NFPA): **http://www.nfpa.org/**

NFPA is a trade association that creates and maintains standards and codes for usage and adoption by local governments.

International Electrotechnical Commission (IEC) **http://www.iec.ch/**

IEC is a nonprofit organization that develops and publishes standards concerning electrical technologies.

Stakeholders in the National Conference on Weights and Measures:

Membership in NCWM is made up of three classes: **Active, Advisory, and Associate**. For the purposes of voting on an agenda item, NCWM is divided into three (3) houses; the House of State Representatives, The House of Delegates, and The House of General Membership. NCWM presently has 2300 members.

Membership Breakdown

Type	Number of Members
Active	1162
Associate	884
Advisory	254
Total	2300

Active Members:

Applies to individuals in the employ of States, Commonwealths, Territories, or Possessions of the United States, their political subdivisions, the Navajo Nation, and the District of Columbia, who are actively engaged in the enforcement of weights and measures laws and regulations.

- Each of these groups designates one official as its representative to the **House of State Representatives**.
- All remaining State, County and City Regulatory Weights and Measures Officials in attendance are seated in the **House of Delegates**.

Advisory Members:

Applies to (1) representatives of agencies of the Federal Government, (2) representatives of state and local governments other than those involved in the enforcement of weights and measures laws and regulations, (3) foreign government officials, and (4) retired persons who are interested in the objectives and activities of the Corporation and who participate as individuals rather than as representatives of a particular industry or interest group.

- These members are seated in the **House of General Membership**.

Associate Members:

Applies to representatives of manufacturers, industry, business, and consumers, and other persons who are interested in the objectives and activities of the Corporation and who do not qualify as Active or Advisory members.

These members are seated in the **House of General Membership**

At the Annual Meeting of the Conference in July of each year, Committees of the Conference present agenda items to the membership for debate and a possible vote. All registered attendees may comment on both business and technical items during open hearings and voting sessions. However, the adoption of technical items and committee reports is to be decided by a formal vote of the active members in accordance with the NCWM Bylaws. For business items presented by the Board of Directors, all NCWM Associate, Advisory and Active members are eligible to vote.

End Users:

NIST/NCWM Publications are used by government agencies at the federal, state, and local levels. The publications when adopted become law, regulations or rules depending on the involved public entity. Private sector users (manufacturers, wholesalers, and retailers) use the publications as guidelines to insure compliance with state and local weights and measures regulations.

Public Sector Users	**Private Sector Users**
Field Inspectors	Manufacturers
Auditors	Producers
Supervising Officials	Commodity Packers
Device Evaluators	Retailers - Consumer Goods
Law Enforcement	Advertisers and Marketers

The timelines below represent five (5) wide ranging recent agenda items.

Compressed Natural Gas/Liquefied Natural Gas - Method of Sale

2013: New Informational Item: Assigned to a new Steering Committee

2014: Item Withdrawn by Submitter

- New Voting Item by same submitter: Returned to Committee
- Steering Committee charged with making recommendations prior to Annual
- Steering Committee provided recommendations in June
- NIST offered an alternative proposal in July for mass
- Voting was on the Steering Committee's version

2015: Voting Item: Returned to Committee

- Conference now had two "compromise" proposals; one establishing volume equivalents and the other establishing mass
- The Committee agreed to move the volume equivalents version for vote

2016: Voting Item

Length of Time on a Committee(s) Agenda – 3 Years

Net Results – ***No New Rule, Regulation or Law Added to Handbooks***

Automatic Temperature Compensation Timeline:

2000: Proposed by WWMA for VTMs

2001: Informational

2002: Voting Item Returned to Committee

2003: Voting Item Returned to Committee

2004: Voting Item Returned to Committee
- New proposed Method of Sale for ATC

2005: Both items were informational

2006: Both items were informational

2007:
- ATC Steering Committee was formed
- NCWM Chair testified at congressional hearing on ATC
- L&R vote on permissive ATC Returned to Committee
- ATC for RMFD was proposed – Informational
- ATC for VTMs was adopted

2008:
- L&R presented informational item with 2 options for ATC recommendation and original proposal
- ATC for RMFD was informational

2009:
- L&R moved item from voting to withdrawn
- S&T retained informational item for RMFDs

2010: S&T withdrew item for RMFDs

Length of Time on a Committee(s) Agenda – 11 Years

Net Results – ***No New Rule, Regulation or Law Added to Handbooks***

Software Identification Timeline

2005: Software Sector was created to address software concerns including identification.

2007: Software Sector submitted G-S.1. Identification as a Developing item

2008: Item was upgraded to Informational

2009: Informational

2010: Informational

2011: Downgraded to Developing

2012: Developing

2013: Developing

2014: Developing

2015: Developing

2016: Voting Item

Length of Time on a Committee(s) Agenda – 12 Years

Net Results – ***No New Rule, Regulation or Law Added to Handbooks***

Pasta Timeline

2010: Voting Item Returned to Committee

2011: Voting Item Returned to Committee

2012: Voting Item Returned to Committee

2013: Adopted

Length of Time on a Committee(s) Agenda – 4 Years

Net Results – ***New Guidance Given on package Inspections - Added to Handbooks***

GPS Systems Timeline

2012: New Developing Item from Seattle

2013: The GPS item was grouped with other taxi items into a new single Developing item for the USNWG on Taximeters.

2014: Developing

2015: Developing

2016:

- USNWG placeholder item is still Developing.
- California proposed a new draft code for GPS systems.
- Additional states are considering adopting standards in advance of NCWM.

Length of Time on a Committee(s) Agenda – 5 Years

Net Results – ***No New Rule, Regulation or Law Added to Handbooks***

Final Actions of Laws and Regulations and Specifications and Tolerances Committees – 2011-2015

In addition to the timelines listed above, the Committee was also provided with data on final actions taken on voting items from two of the Standing Committees for the years 2011 to 2015. The data does not include split votes or status downgrades by the Committees prior to voting.

Laws and Regulations Committee				
Final Actions Taken on Voting Items				
Year	**Item**	**Years in System**	**Action**	**Title**
2011	232-3	1	Adopted	1.7.2. Pelletized Ice Cream
2012	231-3	1	Adopted	10.11. Statements of Cubic Measure in Compressed Form
	232-1	3	Adopted	2.13.4. Declaration of Weight (Polyethylene)
	232-2	1	Adopted	2.19. Kerosene
	232-3	1	Adopted	2.23. Animal Bedding
	232-4	2	Adopted	2.33. Vehicle Motor Oil
	232-7	1	Adopted	2.32.1. Definition of Hydrogen Fuel
	237-1	2	Adopted	2.1.2. Gasoline - Oxygenate Blends
	237-3	1	Adopted	3.3.4. Nozzle Requirements for Diesel Fuel
	237-4	2	Adopted	3.13.1. Labeling of Vehicle Motor Oil
	237-6	1	Adopted	3.2.X. EPA Labeling Requirements Also Apply
	237-7	1	Adopted	4. Retail Storage Tanks and Dispenser Filters
	237-9	4	Adopted	2.XX. Requirements for Hydrogen Fuel
	237-10	2	Adopted	X.X. Definitions Hydrogen Fuel, Internal Combustion Engines, Fuel Cell VehiclesS
	260-4	3	Adopted	4.7. Polyethylene Sheeting Test Procedure
2013	221-1	2	Adopted	1. Definitions
	232-3	1	Adopted	2.33. Oil, 2.33.1.4.5. Tank Trucks and Rail Cars
	232-5	2	Adopted	2.XX. Retail Sale of Electricity/Vehicle
	260-1	4	Adopted	2.3.8. Moisture Loss - Pasta Products
2014	231-2	3	Adopted	10.3. Aerosols and Self-Pressurized Containers
	232-4	2	Adopted	Section 2.33. Oil
	232-6	3	Adopted	2.30. Ethanol Flex Fuel Blends
	232-7	1	Adopted	2.XX. Diesel Exhaust Fluid (DEF)
	232-8	1	Adopted	2.20. Gasoline-Oxygenate Blends
	237-6	2	Adopted	3.13. Oil, 3.13.1. Labeling of Vehicle Engine (Motor) Oil Required
	237-7	1	Adopted	3.2.7. Documentation for Dispenser Labeling Purposes
	237-9	3	Adopted	4. Definitions, 2. Standard Fuel Specifications, 3. Classification and Method of Sale of Petroleum Products
	237-10	1	Adopted	3.XX. Diesel Exhaust Fluid (DEF)
	237-11	1	Adopted	2.12. Motor Oil
	260-2	1	Adopted	3.12. Fresh Oysters Labeled by Volume

2015				
	231-1	2	Adopted	Sections 6.4., 6.5., and 6.7. Addition of Tables
	232-2	2	Withdrawn	Section 2.20.3. Street Sign Prices and Advertising
	260-1	1	Adopted	Section 2.7. Chitterling Test Procedure
	260-2	1	Adopted	Section 3.9. Dimensional Test Procedure for Verifying the Compressed Quantity

Specifications and Tolerances Committee				
Final Actions Taken on Voting Items				
Year	**Item**	**Years in System**	**Action**	**Title**
2011	310-1	4	Adopted	Provision for Sealing Electronic Adjustable Components
	310-3	2	Adopted	G-A.6. Non-retroactive Requirements (Remanufactured Equipment)
	320-2	1	Adopted	T.N.4.7. Creep Recovery for Load Cells
	321-1	4	Adopted	N.3.1.3. Check for Consistency of the Belt Along Its Entire Length
	331-1	1	Adopted	S.2.6. Thermometer Well, Temperature Determination
	336-1	1	Adopted	Appendix D - Definitions of Utility-Type Water Meters
	342-1	2	Adopted	N.5.1. Verification of Master Metering Systems
2012	320-3	1	Adopted	N.3.1.2. Interim Approval
	320-4	1	Adopted	UR.1.2. Grain Hopper Scales
	320-6	1	Adopted	Appendix D - Definitions. Reference weight car
	321-1	1	Adopted	S.1.9. Zero Read Indicator
	321-2	1	Adopted	UR.1. User Requirements
	330-1	1	Adopted	Unit Price Posting…
	330-2	1	Adopted	Selection of Unit Price
	330-3	1	Adopted	Agreement Between Indications
	330-4	1	Adopted	Recorded Representations
	330-5	1	Adopted	Unit Price and Product Identity
	330-6	1	Adopted	Computing Device
	336-1	1	Adopted	S.3. Markings
	358-1	1	Adopted	N.1.3.4. Test Objects with Protrusions
	359-1	1	Adopted	Tentative Status of Code 5.59
2013	320-1	2	Adopted	S.6.4. Railway Track Scales and Appendix D - Definitions
	320-4	2	Adopted	Appendix C - Units of Mass (ton)
	321-1	1	Adopted	UR.1.2. Conveyor Installation
	321-2	1	Adopted	Appendix D - Definitions. Belt Revolution, Belt Load…
	330-2	1	Adopted	Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices

	331-1	1	Adopted	Table 1. Accuracy Classes and Tolerances for VTMs
	331-2	5	Adopted	T.4. Product Depletion Test
	337-3	1	Adopted	Table T.2. Accuracy Classes for MFMs
	356-1	1	Adopted	Table S.2.5. Categories of Device and Method of Sealing
	356-2	2	Adopted	UR.3.4. Printed Tickets
2014	310-2	1	Adopted	G-S.5.6. Recorded Representations
	320-2	1	Adopted	UR.2.4. Foundations, Supports and Clearance
	321-1	1	Adopted	UR.1.2. Conveyor Installation
	330-1	1	Adopted	S.1.6.8. Recorded Representations and UR.3.3. Computing Device
	330-3	2	Adopted	N.4.2.4. Wholesale Devices
	330-5A	2	Adopted	UR.3.3. Computing Device
	330-5B	2	Adopted	UR.3.3. Computing Device
	332-2	1	Adopted	S.1.5.3. Recorded Representations, POS Systems
2015	310-2	1	Adopted	G-UR.4.1. Maintenance of Equipment
	320-2	1	Adopted	T.N.3.5. Separate Main Elements
	320-4	5	Adopted	2.20 Weigh-in-Motion Vehicles Scales for Law Enforcement
	321-1	1	Adopted	A.1. General
	321-2	1	Adopted	S.4. Marking Requirements
	321-3	1	Adopted	N.2.1. Initial Verification
	321-4	1	Adopted	N.2.3. Minimum Test Load
	321-5	1	Adopted	N.3.1.1. Determination of Zero
	321-6	1	Adopted	UR.1.2. Conveyor Installation
	321-7	1	Adopted	UR.3.1. Scale Conveyor Maintenance, Weighing Systems
	321-8	1	Adopted	Appendix D - Definitions. Weigh-belt systems
	330-2	1	Adopted	Table S.3.3. Categories of Device and Methods of Sealing
	354-1	1	Adopted	S.1.1.1. Recording Elements
	354-2	1	Adopted	S.1.2. Advancement of Indicating Elements
	354-3	1	Adopted	S.1.3.3. Passenger Indications
	354-4	1	Adopted	S.1.8. Protection of Indications
	354-5	1	Adopted	S.1.9. Recorded Representation
	360-3	1	Adopted	Appendix D - Definitions. Point-of-sale-system
	360-5	2	Adopted	Electric Vehicle Fueling and Submetering

Conclusions:

The committee members exchanged e-mails and phone calls that fostered discussion on the items identified below. All committee members agree that practical solutions should be developed to address the concerns listed below.

1. Standing Committee agendas include too many items. In recent years, agendas have overwhelmed committee members. Committee work sessions have become all- consuming and diminish the Committee's final work product. Late night time commitments affect committee members' morale and cause difficulties in recruiting new committee members. The existing agenda item designation system only provides guidance to the Committees as it relates to the status of an item.

2. Items remain on committee agendas for indefinite periods of time. Clearly there are agenda items that need extensive development, but ***revisiting and/or voting*** on the same items on a yearly basis raises frustration and causes interested groups to question the credibility of the Conference. Interested parties have bypassed the NCWM process and have reached out to the Federal and State Governments for favorable legislation. Some states have passed "boutique legislation" to address that state's immediate need.

3. Adoption or non-adoption of agenda items by the Conference as a whole occurs just once a year. Items that are ready for a vote or have been voted on and are ready for a revote cannot be revisited until the July Annual Meeting. Voting only once a year inherently slows the approval process.

4. Agenda items can be intensely technical and inconsistent technical knowledge of a specific item by committee members can hinder the study of the item. Committees may not have the expertise or time to develop items, and proposal authors may not have the resources or connections to reach out to affected parties except at national meetings. The result is that items of a technical nature may not be developed adequately before reaching the Committee and may return year after year without significant change because of a continuing lack of resources for development.

5. Committee Chairpersons have broad authority and control over their agendas. The tools provided to committee chairs are explained in detail during the NCWM Committee Orientation process, but we believe committee chairs do not use these tools enough in reviewing agenda content. Also, emphasis should be placed on the most efficient utilization of time outside of the NCWM meeting timeframes to work on agenda items.

6. Comments during open hearings and the voting process at times are not directed to the Committees and their chairpersons, inviting "back and forth" discussions on agenda items. Although comments are strongly encouraged, "back and forth" discussions can cause unnecessary delays and can diminish the time necessary to consider "last minute" changes. As a result, an item deemed by the Committee ready for a vote may be quickly "pulled back" increasing the time it remains on an agenda.

7. Subcommittees perform an important function by advising and assisting the Standing Committees on agenda specific topics. A Subcommittee's recommendation and work product become an integral part of an agenda item. Subcommittee members are subject matter experts, whose expertise and background should be fully utilized by Standing Committees.

8. Every proposal/agenda item presented to a regional association and/or to NCWM is distinct and raises a corresponding level of interest. Determining "how long" an item takes to move through the NCWM process is difficult and is driven by the uniqueness (technical nature and the widespread effect on the marketplace) of agenda items. Data suggests that most items move relatively smoothly through the conference approval process, but that suggestion is clearly diminished by the uniqueness of an item.

NCWM members representing different interests have raised concerns that NCWM will not be able rise to the challenges it will confront in the 21st Century. Finding solutions to the concerns identified above will greatly assist the conference in meeting those challenges.

Mr. John Gaccione, Westchester County, New York | Chairman and Northeastern Representative
Dr. Matthew Curran, Florida | Southern Representative
Mr. Joseph Gomez, New Mexico | Western Representative
Ms. Julie Quinn, Minnesota | Central Representative
Mr. Robert Murnane, Seraphin Test Measure, Co. | Associate Membership
Mr. David Calix, NCR Corporation | Associate Membership
Mr. Don Onwiler, NCWM
Ms. Carol Hockert, NIST/OWM (Retired)

Team Charter Committee Members

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Report of the Laws and Regulations (L&R) Committee

Richard Lewis, Committee Chair
Georgia

200 INTRODUCTION

This is the report of the Laws and Regulations (L&R) Committee (hereinafter referred to as the "Committee") for the 101st Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, "Committee Reports," testimony at public hearings, comments received from regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting and actions taken by the membership at the voting session of the Annual Meeting. The voting items shown below were adopted as presented when this report was approved. This report contains those recommendations to amend National Institute of Standards and Technology (NIST Handbook 130, "Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality (2016)," and the NIST Handbook 133, "Checking the Net Contents of Packaged Goods (2016)."

Table A identifies the agenda and appendix items by reference key, title of item, page number, and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of the Reference Key Numbers of the items are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered individually; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the open hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows. 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), and 2) proposed new language is indicated with an **underscore bold faced font** (e.g., **new items**). When used in this report the term "weight" means "mass".

Note: The policy of NIST is to use metric units of measurement in all its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to U.S. customary units.

Subject Series List

Table A
Table of Contents

Table B
Glossary of Terms and Acronyms

Acronym	Term	Acronym	Term
AAP	Average Adjusted Purge	HB 44	NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"
AKI	Minimum Antiknock Index	IRS	Internal Revenue Service
ASTM	ASTM International	LNG	Liquefied Natural Gas
ATC	Automatic Temperature Compensation	MATG	Moisture Allowance Task Group
BTU	British Thermal Unit	MON	Motor Octane Number
CFR	Code of Federal Regulations	MAV	Maximum Allowable Variation
DGE	Diesel Gallon Equivalent	NIST	National Institute of Standards and Technology
DLE	Diesel Liter Equivalent	OWM	Office of Weights and Measures
DOE	Department of Energy	PALS	Packaging and Labeling Subcommittee
EPA	Environmental Protection Agency	PMAA	Petroleum Marketers Association of America
FALS	Fuels and Lubricants Subcommittee	RMFD	Retail Motor Fuel Dispenser
FDA	Food and Drug Administration	S&T	Specifications and Tolerances
FPLA	Fair Packaging and Labeling Act	SCF	Sample Correction Factor
FSIS	Food Safety and Inspection Service	SEL	Sample Error Limit
FTC	Federal Trade Commission	SIGMA	Society of Independent Gasoline Marketers of America
GGE	Gasoline Gallon Equivalent	SP	Special Publication
GLE	Gasoline Liter Equivalent	SWMA	Southern Weights and Measures
GM	General Motors	TG	Task Group
L&R	Laws and Regulations	UPLR	Uniform Packaging and Labeling Regulation
HB 133	NIST Handbook 133, "Checking the Net Contents of Packaged Goods"	USNWG	U.S. National Work Group
NACS	National Association of Convenience Stores	WG	Work Group
NATSO	National Association of Truck Stop Operators	WWMA	Western Weights and Measures Association

Table C
Voting Results

Reference Key Number	*House of State Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
Consent Calendar					
231-1	37	0	48	0	Adopted
232-2					Adopted
232-4					Adopted
232-5					Adopted
260-2					Adopted
260-3					Adopted
260-5					Adopted
232-7	36	1	43	0	Adopted
232-8*	30	7	30	11	Adopted
237-1	37	1	34	3	Adopted
237-2	39	0	48	0	Adopted
232-6	26	11	20	21	Returned to Committee
237-6	16	16	34	8	Returned to Committee
260-1 To hear amendment	Yea: 66 Nay: 1				Amendment was heard
260-1 To amend	No Vote				Committee moved to Informational Status
To Accept the Report	Voice Vote				Adopted

* Items 232-8 and 337-2 were voted upon as a block.

Details of All Items
(In order by Reference Key)

231 NIST HANDBOOK 130 – A. UNIFORM PACKAGING AND LABELING REGULATION

231-1 V 1. Background, Section 5. Declaration of Responsibility: Consumer and Non-Consumer Packages, 6.7.1. Symbols and Abbreviations, and Section 13. Retail Sale Price Representations

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Amend NIST Handbook 130, Uniform Packaging and Labeling Regulations to have the requirements conform to the language finalized by the Federal Trade Commission (FTC) in their revision to regulations promulgated under the Fair Packaging and Labeling Act (FPLA).

Item under Consideration:

1. Background

The Uniform Packaging and Labeling Regulation was first adopted during the 37th Annual Meeting of the National Conference on Weights and Measures (NCWM) in 1952. Reporting to the Conference, the Committee on Legislation stated:

The National Conference should adopt a model package regulation for the guidance of those states authorized to adopt such a regulation under provisions of their weights and measures laws. Since so much of the work of weights and measures officials in the package field concerns food products, the importance of uniformity between the Federal (FDA) regulations and any model regulations to be adopted by this Conference cannot be overemphasized.

Since its inception, the Uniform Packaging and Labeling Regulation has been continually revised to meet the complexities of an enormous expansion in the packaging industry – an expansion that, in late 1966, brought about the passage of the Fair Packaging and Labeling Act (FPLA). Recognizing the need for compatibility with the Federal Act, in 1968 the Committee on Laws and Regulations of the 53rd Annual Meeting of the National Conference amended the "Model Packaging and Labeling Regulation" (renamed in 1983) to parallel regulations adopted by federal agencies under FPLA. The process of amending and revising this Regulation is a continuing one in order to keep it current with practices in the packaging field and make it compatible with appropriate federal regulations. Amendments and additions since 1971 are noted at the end of each section.

The revision of 1978 provided for the use of the metric system (SI) on labels as well as allowing SI-only labels for those commodities not covered by federal laws or regulations. "SI" means 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 the "Interpretation of the International System of Units for the United States" in the "Federal Register" (Volume 73, No. 96, pages 28432 to 28433) for May 16, 2008, and 15 United States Code, Section 205a - 205l "Metric Conversion." See also NIST Special Publication 330 "The International System of Units (SI)" 2008 edition and NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" 2008 edition that are available at **www.nist.gov/pml/wmd/** or by contacting **TheSI@nist.gov**.] In 1988, Congress amended the Metric Conversion Law to declare that it is the policy of the United States to designate the International System of Units of measurement as the preferred system of weights and measures for U.S. trade and commerce. In 1992, Congress amended the federal FPLA to require the most

appropriate units of the SI and the U.S. customary systems of measurement on certain consumer commodities. The 1993 amendments to NIST Handbook 130 require SI and U.S. customary units on certain consumer commodities in accordance with federal laws or regulations. Requirements for labeling in both units of measure were effective February 14, 1994, under FPLA and as specified in Section 15. Effective Date; except as specified in Section 11.32. SI Units, Exemptions for Consumer Commodities.

In 2015, the Federal Trade Commission (FTC) conducted a periodic review of its regulations issued under the FPLA and recently published several revisions which go into effect on December 17, 2015. [See the "Rules, Regulations, Statements of General Policy or Interpretation and Exemptions Under the Fair Packaging and Labeling Act] Final Rule" in the "Federal Register" (Volume 80, No. 221, pages 71686 to 71689) dated Tuesday, November 17, 2015. In response to comments from the NCWM's Packaging and Labeling Subcommittee, the FTC amended its regulations to clarify that exponents may be used in conjunction with U.S. customary units and recognized that with today's online resources the location of a business can be readily obtained in lieu of using a printed telephone directory. The FTC amended its regulations on the Declaration of Responsibility to allow the street address to be omitted if it is accessible in a printed or online telephone directory, or any readily accessible, widely published and publicly available resource. In response to a concern that the existing regulation included a limited table of metric conversions, the FTC decided to incorporate the more comprehensive metric conversion tables to provide users with the wide range of factors in NIST Handbook 133 (2015) "Checking the Net Contents of Packaged Goods," Appendix E, General Tables of Units of Measurements. The FTC also revoked regulations on certain retail price sale representations, since they are no longer used in the marketplace. The regulation was also amended to aid state and local compliance efforts by alerting users of the role of the states in regulating packages that fall outside the scope of the FTC's purview under the FPLA.

(Added 2016)

Nothing contained in this regulation should be construed to supersede any labeling requirement specified in federal law or to require the use of SI units on non-consumer packages.

Section 5. Declaration of Responsibility: Consumer and Non-Consumer Packages

Any package kept, offered, or exposed for sale, or sold at any place other than on the premises where packed shall specify conspicuously on the label of the package the name and address of the manufacturer, packer, or distributor. The name shall be the actual corporate name, or, when not incorporated, the name under which the business is conducted. The address shall include street address, city, state (or country if outside the United States), and ZIP Code (or the mailing code, if any, used in countries other than the United States); however, the street address may be omitted ~~**if this is shown in a current city directory or telephone directory**~~ **if it is listed in any readily accessible, well-known, widely published, and publicly available resource, including but not limited to a printed directory, electronic database or Web site.**

(Amendment effective December 17, 2015)

If a person manufactures, packs, or distributes a commodity at a place other than his principal place of business, the label may state the principal place of business in lieu of the actual place where the commodity was manufactured or packed or is to be distributed, unless such statement would be misleading. Where the commodity is not manufactured by the person whose name appears on the label, the name shall be qualified by a phrase that reveals the connection such person has with such commodity, such as "Manufactured for and packed by _____," "Distributed by _____," or any other wording of similar import that expresses the facts.

(Amended 2016)

6.7.1. Symbols and Abbreviations. – Any of the following symbols and abbreviations, and none other, shall be employed in the quantity statement on a package of commodity:

avoirdupois	avdp	ounce	oz
piece	pc	count	ct
pint	pt	cubic	cu
pound	lb	each	ea
feet or foot	ft	quart	qt
fluid	fl	square	sq
gallon	gal	weight	wt
inch	in	yard	yd
liquid	liq	drained	dr
diameter	dia		

A period should not be used after the abbreviation. Abbreviations should be written in singular form; and "s" should not be added to express the plural. (For example, "oz" is the symbol for both "ounce" and "ounces.") Both upper and lower case letters **and exponents** are acceptable.
(Amendment effective December 17, 2015)
(Added 1974) (Amended 1980, 1990, ~~and~~ 1993**, and 2016)**

~~**Section 13. Retail Sale Price Representations**~~

~~**13.1. "Cents off" Representations.**~~

~~**(a) The term "cents off representation" means any printed matter consisting of the words "cents off" or words of similar import (bonus offer, 2 for 1 sale, 1¢ sale, etc.), placed upon any consumer package or placed upon any label affixed or adjacent to such package, stating or representing by implication that it is being offered for sale at a price lower than the ordinary and customary retail sale price.**~~

~~**(Amended 1982)**~~

~~**(b) Except as set forth in Section 13.2. Introductory Offers, the packager or labeler of a consumer commodity shall not have imprinted thereon a "cents off" representation unless:**~~

~~**(1) The commodity has been sold at an ordinary and customary price in the most recent and regular course of business where the "cents off" promotion is made.**~~

~~**(2) The commodity so labeled is sold at a reduction from the ordinary and customary price, which reduction is at least equal to the amount of the "cents off" representation imprinted on the commodity package or label.**~~

~~**(3) Each "cents off" representation imprinted on the package or label is limited to a phrase that reflects that the price marked by the retailer represents the savings in the amount of the "cents off" the retailer's regular price; e.g., "Price Marked is ____ Cents Off the Regular Price," "Price Marked is ____ off the Regular Price of this Package", provided the package or label may in addition bear in the usual pricing spot a form reflecting a space for the regular price, the represented "cents off," and a space for the price to be paid by the consumer.**~~

~~**(4) The commodity at retail presents the regular price, designated as the "regular price", clearly and conspicuously on the package or label of the commodity or on a sign, placard, or shelf marker placed in a position contiguous to the retail display of the "cents off" marked commodity.**~~

i. Not more than three "cents off" promotions of any single size commodity may be initiated in the same trade area within a 12-month period;

ii. At least 30 days must lapse between "cents off" promotions of any particular size packaged or labeled commodity in a specific trade area; and

iii. Any single size commodity so labeled may not be sold in a trade area for a duration in excess of six months within any 12-month period.

(5) Sales of any single size commodity so labeled in a trade area do not exceed in volume 50 % of the total volume of sales of such size commodity in the same trade area during any 12-month period. The 12-month period may be the calendar, fiscal, or market year provided the identical period is applied in this subparagraph and subparagraph (5) of this paragraph. Volume limits may be calculated on the basis of projections for the current year, but shall not exceed 50 % of the sales for the preceding year in the event actual sales are less than the projection for the current year.

(c) No "cents off" promotion shall be made available in any circumstances where it is known or there is reason to know that it will be used as an instrumentality for deception or for frustration of value comparison; for example, where the retailer charges a price that does not fully pass on to the consumers the represented price reduction or where the retailer fails to display the regular price in the display area of the "cents off" marked product.

(d) The sponsor of a "cents off" promotion shall prepare and maintain invoices or other records showing compliance with this section. The invoices or other records required by this section shall be open to inspection and shall be retained for a period of one year subsequent to the end of the year (calendar, fiscal, or market) in which the "cents off" promotion occurs.

(Added 1972)

13.2. Introductory Offers

(a) The term "introductory offer" means any printed matter consisting of the words "introductory offer" or words of similar import, placed upon a package containing any new commodity or upon any label affixed or adjacent to such new commodity, stating or representing by implication that such new commodity is offered for retail sale at a price lower than the anticipated ordinary and customary retail sale price.

(b) The packager or labeler of a consumer commodity may not have imprinted thereon an introductory offer unless:

(1) The product contained in the package is new, has been changed in a functionally significant and substantial respect, or is being introduced into a trade area for the first time.

(2) Each offer on a package or label is clearly and conspicuously qualified.

(3) No commodity so labeled is sold in a trade area for duration in excess of six months.

(4) At the time of making the introductory offer promotion, the offerer intends in good faith to offer the commodity, alone, at the anticipated ordinary and customary price for a reasonably substantial period of time following the duration of the introductory offer promotion.

(c) The packager or labeler of a consumer commodity shall not have imprinted thereon an introductory offer in the form of a "cents off" representation unless, in addition to the requirements in paragraph (b) of this section:

(1) The package or label clearly and conspicuously and in immediate conjunction with the phrase "Introductory Offer" bears the phrase "_____ cents off the after introductory offer price."

(2) The commodity so labeled is sold at a reduction from the anticipated ordinary customary price, which reduction is at least equal to the amount of the reduction from the after introductory offer price representation on the commodity package or label.

(d) No introductory offer with a "cents off" representation shall be made available in any circumstance where it is known or there is reason to know that it will be used as an instrumentality for deception or for frustration of value comparison; e.g., where the retailer charges a price that does not fully pass on to consumers the represented price reduction.

(e) The sponsor of an introductory offer shall prepare and maintain invoices or other records showing compliance with this section. The invoices or other records required by this section shall be open to inspection and shall be retained for a period of one year subsequent to the period of the introductory offer.

(Added 1972)

13.3. Economy Size.

(a) The term "economy size" means any printed matter consisting of the words "economy size," "economy pack," "budget pack," "bargain size," "value size," or words of similar import placed upon any package containing any consumer commodity or placed upon any label affixed or adjacent to such commodity, stating or representing directly or by implication that a retail sale price advantage is accorded the purchaser thereof by reason of the size of that package or the quantity of its contents.

(b) The packager or labeler of a consumer commodity may not have imprinted thereon an "economy" size representation unless:

(1) At the same time the same brand of the commodity is offered in at least one other packaged size or labeled form.

(2) Only one packaged or labeled form of that brand of commodity labeled with an "economy size" representation is offered.

(3) The commodity labeled with an "economy size" representation is sold at a price per unit of weight, volume, measure, or count that is substantially reduced (i.e., at least 5 %) from the actual price of all other packaged or labeled units of the same brand of that commodity offered simultaneously.

(c) No "economy size" package shall be made available in any circumstances where it is known that it will be used as an instrumentality for deception; e.g., where the retailer charges a price that does not pass on to the consumer the substantial reduction in cost per unit initially granted.

(d) The sponsor of an "economy size" package shall prepare and maintain invoices or other records showing compliance with paragraph (b) of this section. The invoices or other records required by this section shall be open to inspection and shall be retained for one year.

(Added 1972)

Editor's Note: Section 14. "Effective Date" was renumbered to Section 13.

Background/Discussion:
The Federal Trade Commission (FTC) finalized revisions to regulations promulgated under the Federal Fair Packaging and Labeling Act (FPLA). This proposal is to amend NIST Handbook 130, Uniform Packaging and Labeling Regulations to have the requirements conform to the language finalized by FTC in their revision to regulations promulgated under the FPLA. These amendments will align the requirements of the UPLR with FTC regulations that are effective December 17, 2015, (**www.gpo.gov/fdsys/pkg/FR-2015-11-17/pdf/2015-28918.pdf**). This proposal modifies the following Sections in NIST Handbook 130, Uniform Packaging and Labeling Regulations; Background, Section 5. Declaration of Responsibility: Consumer and Non-Consumer Packages, 6.7.1. Symbols and Abbreviations, and removing Section 13. Retail Sale Price Representations in its entirety.

This item was accepted as a Priority Item by the Committee for inclusion into the L&R Committee's agenda at the 2016 NCWM Interim Meeting. The Committee recommends this as a Voting item.

232 NIST HANDBOOK 130 – UNIFORM REGULATION FOR THE METHOD OF SALE OF COMMODITIES

232-1 D Section 1. Food Products and Section 2. Non-Food Products

Source:
Los Angeles County, California (2016)

Purpose:
Clarify and formalize the long-standing, fundamental, core tenet of legal metrology and weights and measures regulation that the sale of any commodity, in any form or by any method, be according to legally-recognized, traceable units of measure.

Item under Consideration:
Amend NIST Handbook 130, Uniform Regulation for the Method of Sale of Commodities as follows:

Section 1. Food Products

(a) Any food product, whether sold from bulk or in packaged form, shall be sold only in a unit of measure or weight that meets all of the following criteria:

(1) is recognized and defined by NIST as legal for use in commerce;

(2) has been published in the "Federal Register"; and

(3) has metrological traceability *(NOTE #, page #)* to a national standard.

Note: Sale of a product or commodity according to count, where appropriate to be fully informative to facilitate value comparison, is permissible as a method of sale.

(b) Only the following commodities may be exempted from the method of sale limitations set forth in Section 1.(a) and permitted to be sold according to "head" or "bunch," as appropriate:

(1) asparagus;

(2) Brussels sprouts (on stalk);

(3) rhubarb;

(4) edible bulbs (onions [spring or green], garlic, leeks, etc.);

(5) flower vegetables (broccoli, cauliflower, Brussel sprouts, etc.);

(6) leaf vegetables (lettuce, cabbage, celery, parsley, herbs, loose greens, etc.); and

(7) root vegetables (turnips, carrots, radishes, etc.).

(Added 20XX)

And

Section 2. Non-food Products [*NOTE 1*, page 109]

(a) Any non-food product, whether sold from bulk or in packaged form, shall be sold only in a unit of measure or weight that meets all of the following criteria:

(1) is recognized and defined by NIST as legal for use in commerce;

(2) has been published in the "Federal Register"; and

(3) has metrological traceability *(NOTE #, page #)* **to a national standard.**

Note: Sale of a product or commodity according to count, where appropriate to be fully informative to facilitate value comparison, is permissible as a method of sale.

(b) The only exemption from the method of sale limitations set forth in Section 2(a) shall be retail sales of compressed natural gas (CNG) sold as a vehicle fuel, which are permitted to be sold in terms of gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE) as defined in Section 2.27.1. Definitions.

Note: As defined in NIST Handbook 130, Uniform Weights and Measures Law, Metrological traceability means the property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

(Added 20XX)

Background/Discussion:
Much discussion and debate has been undertaken within the NCWM over the past two years regarding proposals for methods of sale of commodities (specifically, liquefied natural gas [LNG] and compressed natural gas [CNG] as vehicle fuels) based upon "equivalencies" to other methods of sale for different commodities (in these recent cases, based upon calculated average energy content comparisons to gasoline or diesel fuel). With the exception of a singular commodity, CNG, for which gasoline-liter-equivalent (GLE) and gasoline-gallon-equivalent (GGE) methods of sale were permitted some 20 years ago, the methods of sale for all other commodities have historically and consistently been established based upon legally-recognized units of weight or measure that are traceable to national standards maintained by NIST, the sole exceptions (found in interpretations and guidelines) being specific fresh vegetable commodities permitted to be sold by "head" or "bunch." Discussions surrounding considerations of "equivalency" units have raised the potential for untold similar proposals to establish methods of sale for countless competing products in the marketplace claiming comparisons of performance, quality, energy or nutritional content, or other factors that can be subjective, widely varying due to inconsistent chemical or biological makeup, or a host of other influences that are, or may be, based on little to no scientific or metrologically sound and traceable determinations or calculations.

While a core tenet of weights and measures regulation and legal metrology – whether regarding design and function of weighing and measuring devices or sales of commodities – has always been widely recognized to require employment of units of measure that are recognized and published as legal for use and having metrological traceability, clear language in model laws and regulations developed by NCWM and published in NIST Handbooks is absent, likely never heretofore being deemed necessary due to the well-established, long-held tenet. This proposal serves to codify, memorialize, and specifically clarify that tenet as a formal adoption in the Uniform Regulation for

the Method of Sale of Commodities to ensure against potentially misleading, confusing, or unclear business practices in commerce, whether in sales from bulk or in labeling of packaged commodities, that may be based upon observations, calculations, assumptions, or other considerations that may be subjective and not metrologically traceable.

At the 2016 NCWM Interim Meeting, Mr. Kurt Floren (Los Angeles County, California) remarked that this proposal would codify a long-standing practice. This is not intended to interfere with the current debate on liquefied natural gas (LNG). Mr. Floren encouraged the item on LNG to have a vote prior to considering this item. If the LNG proposal is adopted, this item could be amended from the floor of the Conference. A former regulator remarked that Uniform Weights and Measures Law, Section (n) allows the term or unit of weight or measure be used if it is determined that it is an existing or firmly established practice. He further commented that this proposal conflicts with Weights and Measures Law Section 12(n) that states this is a state function, not NIST controlled. The term "traceability" is in NIST Handbook 130, Uniform Weights and Measures Law. NIST remarked that when changes are made to NIST SP 811, "The NIST Guide for use of International System of Units" or NIST SP 330, "The International System of Units (SI)" it is required that a "Federal Register" notice be announced. The Committee is unclear as to what issue this proposal resolves. The Committee would also like to know what impact this would have for all items covered under the current Method of Sale of Commodities Regulation. The Committee agreed to move this forward as a Developing item.

At the 2016 NCWM Annual Meeting, the submitter had no updates for the Committee, but stated this is a commonsense practice in determining the method of sale of commodities.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Kurt Floren, (Los Angeles County, California) advised that the proposal is intended to place into the model regulations a legally recognized, traceable unit of measure and such specific language does not appear in current NIST handbooks even though it has been a longstanding requirement. An industry representative said to use caution in moving forward with this item, as there may be some unintended consequences; specifically, related to non-food items, such as a toaster. Mr. Floren responded, pointing out that sales by count, where appropriate, are specifically permitted in the proposal. Three regulators supported the concept and idea. One regulator expressed concern because of the ongoing LNG debate. A regulator stated any product can petition for exemption. During the voting session, an industry member commented that in the report, the last paragraph under the "Background/Discussion" was confusing and suggested it should be deleted or revised. WWMA forwarded this item to NCWM, recommending that it be a Voting item.

At the 2015 CWMA Interim Meeting, an industry representative remarked that the WWMA modified the original version, omitting the last paragraph. He suggested the CWMA consider the same version as the WWMA. He also commented he had concerns of unintended consequences for products that do not currently have a net content requirement. A state regulator expressed a similar sentiment, and felt the proposal needs to be further developed and clarified, as to what is included and what is not included. Other state regulators agreed, there needed to be clear and distinct parameters, and one state commented that measure by count is already established. The Committee considered the timely nature of this issue and determined there were no major concerns, which would preclude it from being ready for voting status by July 2016. The CWMA forwarded the item to NCWM, recommending it be a Voting item.

At the 2015 NEWMA Interim Meeting, a state regulator questioned the meaning of the term "bunch." A consultant and former regulator indicated this item serves no purpose and should be sent back to the originator for further development. He also indicated that the term "bunch" has been used for a long time, and if the consumer is comfortable with purchasing in this unit, it should be permitted. Another regulator was not sure what this agenda item clarifies and would like to have additional information. Another state regulator indicated he agreed with other state regulators that he saw no real purpose for this item. Since there is no clear direction for this item, the region felt the item needs further clarification and development by both the regulatory community, as well as industry. NEWMA forwarded the item to NCWM, recommending that it be a Developing item.

At the 2015 SWMA Annual Meeting, it was recommended that all sections within the proposed CNG/LNG items be reviewed to determine if additional exemptions are required to avoid language conflicts with this proposed language. SWMA forwarded the item to NCWM and recommended it be an Informational item.

At the 2016 NEWMA Annual Meeting, a retired weights and measures Director expressed several concerns with this proposal. He remarked that over 80 % of items in commerce do not have a method of sale because buyers and sellers have agreed upon the terms of sale. The only time commodities are included in the regulations are due to a dispute between the buyer and seller. NEWMA believes that this proposal could have a negative impact on commerce and recommends that it be Withdrawn.

232-2 V Section 1.5. Meat, Poultry, Fish, and Seafood.

(This item was Adopted.)

Source:
Massachusetts Division of Standards (2015)

Purpose:
To allow the retail sale of meat, poultry and fish by count with adequate consumer information.

Item under Consideration:
Amend NIST Handbook 130, Uniform Regulation for the Method of Sale of Commodities as follows:

1.5. Meat, Poultry, Fish, and Seafood. [***NOTE 3***, page 110] – Shall be sold by weight, except that whole shellfish in the shell may be sold by weight, measure, and/or count. Shellfish are aquatic animals having a shell, such as mollusks (for example, scallops) or crustaceans (for example, lobster or shrimp).

~~**(Amended 1988)**~~

(a) When meat, poultry, fish, or seafood is kept, offered or exposed for sale from bulk (e.g., direct service counters), by the portion or piece according to a pre-determined fixed weight, the product identity and net weight shall be displayed, as well as the unit price at which it is offered for sale. This information shall appear on a label or sign immediately adjacent to the meat, poultry, fish or seafood and must be presented in an easy-to-read type style and color. The font size of the net weight and unit price declaration shall be equal to or greater than the font size used for the product identity.

(b) The unit price required under Sections 1.5.(a) shall be in terms of the unit price-per-kilogram or unit price-per-pound, and not in common or decimal fractions of the permitted units. A supplemental declaration of a price per unit (i.e., price per ounce) is permitted.

(c) Similar or competing commodities kept, offered, or exposed for sale from bulk in any single display or facility shall have unit prices posted or advertised in the same terms uniformly and consistently expressed (i.e., all in either prices–per-kilogram or prices–per pound, not in differing units) to readily facilitate value comparison.

(Amended 1988 **and 2016**)

NOTE 3: *See Section 1.12. Ready-to-Eat Food for additional requirement.*

1.5.1. In Combination with Other Foods. – When meat, poultry, fish, or seafood is combined with some other food element to form a distinctive food product, the quantity representation may be in terms of the total weight of the product or combination, and a quantity representation need not be made for each element provided a statement listing the ingredients in order of their predominance by weight must also appear on the label.

Note: See Interpretations and Guidelines Section 2.2.13. Declaration of Identity: Consumer Package and Labeling Regulation (UPLR).

(Amended 1989)

1.5.2. Clams, Mussels, Oysters, and Other Mollusks.

1.5.2.1. Whole Clams, Oysters, Mussels, or Other Mollusks in the Shell (fresh or frozen). – Shall be sold by weight (including the weight of the shell, but not including the liquid or ice packed with them), dry measure (e.g., bushel), and/or count. In addition, size designations may be provided.

1.5.2.2. Whole Clams, Oysters, Mussels, or Other Mollusks on the Half Shell (fresh, cooked, smoked, or frozen, with or without sauces or spices added). – Shall be sold by weight (excluding the weight of the shell) or by count. Size designations may also be provided.

(Added 1989)

1.5.2.3. Fresh Oysters Removed from the Shell. – Shall be sold by weight, drained weight, or by fluid volume. For oysters sold by weight or by volume, a maximum of 15 % free liquid by weight is permitted.

(Amended 1991)

1.5.2.4. Processed Clams, Mussels, Oysters, or Other Mollusks on the Half Shell (fresh or frozen). – Shall be sold by net weight excluding the weight of the shell. The term "processed" means removing the meat from the shell and chopping it or cutting it or commingling it with other solid foods.

(Amended 1989)

1.9. Advertising and Price Computing of Bulk Food Commodities

1.9.1. Total Price Computing. – The price of food commodities sold from bulk by weight shall be computed in terms of whole units of weight (i.e., **price per** ~~**grams**~~, kilograms, pounds, **grams**, ounces, etc.) and not in common or decimal fractions.

(Amended 1989 **and 2016**)

1.9.2. Unit Price Advertising. – The **unit** price of food commodities sold from bulk shall be advertised or displayed in terms of **the price per** whole **units of** weight **in** ~~**of**~~ kilograms or pounds only, not in common or decimal fractions **of a kilogram or pound** or in ounces. A supplemental declaration **of a price per unit (i.e., price per ounce)** is permitted in **font size** ~~**print**~~ no larger than the whole unit price. This supplemental declaration may be expressed in common or decimal fractions or in ounces.

(Added 1976) (Amended 1985, 1987, ~~**and**~~ 1991**, and 2016)**

1.9.3. Individual Piece Advertising. – The unit price and net weight of any food commodity offered or exposed for sale from bulk by the portion or piece, according to a pre-determined fixed weight, shall be advertised or displayed to include a declaration of the individual item price, a unit price in terms of kilogram or pound and net weight in terms of kilograms or pounds or decimal fractions, thereof. The font size of the net weight and unit price declaration shall be equal to or greater than the font size used for the product identity.

NOTE: For specific requirements on Meat, Poultry, Fish and Seafood refer to Section 1.5. Meat, Poultry, Fish, and Seafood.

(Added 2016)

Background/Discussion:
Several jurisdictions have reported that meat and meat products are routinely being sold by count both with and without a net weight declaration or unit price, many times alongside meat products that are being sold by weight. This approach does not give the consumer enough information to make value comparisons and may be misleading; however, it is believed this amendment will remedy this. Retailers will benefit from this amendment by having more options for the method of sale of these products; consumers will benefit from this amendment because they will be able to make informed value comparisons; and weights and measures officials will be able to ensure accuracy of net weight declarations and unit price calculations.

At the 2015 NCWM Interim Meeting, a regulator remarked that the regulations are clearly defined in the handbook and any changes would cause confusion. Several states opposed this item as written. The NIST Technical Advisor remarked that this item was posted on the NIST State Director List Server and several states expressed concern on labeling issues in the marketplace. The State of Florida commented that they had an issue in their marketplace but worked directly with the grocers to clarify. The NIST Technical Advisor presented the following to the Committee for review:

1.5. Meat, Poultry, Fish, and Seafood. [*NOTE 3*, page 110] – Shall be sold by weight, except that whole shellfish in the shell may be sold by weight, measure, and/or count. Shellfish are aquatic animals having a shell, such as mollusks (for example, scallops) or crustaceans (for example, lobster or shrimp). **The net weight declaration for meat, poultry, fish and seafood shall be by the kilogram, gram or pound and not by portion or piece except as permitted below:**

(a) If meat, poultry, fish, and seafood is kept, offered or exposed for sale or sold at the retail store level in standard weight packages (refer to the Uniform Packaging and Labeling Regulation (UPLR), Section 6.16., Random Packages) the net weight, total price and unit price must appear on the principal display panel of each package and must conform to all of the applicable requirements of the UPLR. This section does not apply to packages of meat or poultry that bear a USDA Inspection Seal and plant identity and a label that conform to the net weight labeling requirements of the USDA Food Safety and Inspection Service (FSIS).

(b) If meat, poultry, fish, and seafood is kept, offered or exposed for sale from bulk (e.g. direct service counters) by the portion or piece the product identity and net weight shall be displayed along with the unit price at which it is offered for sale. This information shall appear on a label or sign adjacent to the meat, poultry, fish or seafood and must be presented in an easy-to-read type style and color and must appear on a single-color contrasting background.

(c) The unit prices required under Sections 1.5.(a) and 1.5.(b) shall be in terms of the unit price-per-kilogram; or unit price-per-100 grams; or unit price-per-pound, and not in any other unit or denomination or in common or decimal fractions of the permitted units.

(Amended 1998 **and 20XX**)

The traditional method of sale for meat and poultry at retail has been to sell by the pound in decimal units (i.e., 1.5 lb). NIST Handbook 44, Section S.1.8.4., Customer Indications in the Scale Code requires the display of the whole units of weight but permits unit pricing for metric units to appear as price per kilogram or price per 100 g. Any proposal in the method of sale should be consistent with the scale code or retailers will not have the equipment they need to do the job.

NIST, OWM understands that retailers are attempting to shift from the traditional method of sale of decimal pounds over to the sale of meat by the piece, but still by weight (but in ounces). This is currently acceptable; however, as this practice is emerging in many states, it appears to hinder or frustrate the consumer's ability to make value comparisons between packaged meat and sales from bulk.

At least one state has obtained a court ruling that prohibits the sale of the same product by different methods of sale within the same retail location, specifically because it hinders value comparison.

In the example given below, the consumer must divide the price by ounces to obtain a price per ounce and multiply that value by 16 to obtain a price per pound, to compare the unit price offered in the bulk sales counter to the unit price of the same identical type of meat offered for sale in a random weight prepackage by the decimal pound.

Example, for a 5-ounce piece of meat: $5.99 ÷ 5 = $1.198 per ounce × 16 = $19.16 per pound

It appears that to maintain the traditional method of sale and pricing (i.e., offered for sale by decimal pounds and unit pricing by the pound) the Method of Sale Regulation (and, because not all states adopt the method of sale regulation, perhaps the UPLR) should be revised to only permit sales by the decimal pound or kilogram, and unit prices be revised

to only appear in terms of price per pound or kilogram (or price per 100 grams [per NIST Handbook 44]). For sales of food from bulk, unit price advertising by the ounce should be prohibited in Section 1.9.2. Unit Price Advertising and Section 1.9.1. Total Price Computing.

Another suggestion provided by NIST, OWM is to change the title of Section 1.9., Advertising and Price Computing of Bulk Food Commodities to read:

1.9. Advertising and Price Computing of Bulk ~~Food~~ and Prepackaged Food Commodities.

1.9.1. Total Price Computing. – The **total** price of food commodities sold from bulk **and in packages shall be** by weight **and the total price** shall be computed in terms of whole units of weight (i.e., **price per 100** grams, **or price per** kilogram, **or price per** pound, ~~**ounces**~~, etc.) and not in common or decimal fractions.

1.9.2. Unit Price Advertising. – The **unit** price of food commodities sold from bulk **and in packages** shall be advertised or displayed in terms of whole **units of** weight of kilograms, (**or price per 100 grams**) or pounds only, not in common or decimal fractions. ~~**or in ounces**~~. A supplemental declaration is permitted in print no larger than the whole unit price. This supplemental declaration may be expressed in common or decimal fractions. ~~**or in ounces.**~~

1.9.3. Individual Piece Advertising. – The unit price and net weight of food commodities offered or exposed for sale by the each from bulk shall include a declaration of the individual item price, a unit price in terms of decimal kilograms or pounds or price per 100 grams and net weight in terms of decimal kilograms or pounds. The net weight and unit price declaration shall be presented adjacent to the item price in type size no less than one-half the height of the item price and shall be displayed as clear and conspicuous as the item price.

Example:
Tuna Steaks
$5.99 Each

NET WT 0.31 LB
$19.16 PER LB

Various pricing schemes found in the marketplace by the states:

Figure 1. Being Sold by Each.

Figure 2. Label Identifier. The Identifier on the label states "5 oz bnls pork chops." The random pack label has a net weight that differs from package to package.

At the NCWM 2015 Interim Meeting, the Committee heard comments to Withdraw this item. The Committee would like to receive additional feedback from all the Regions. For these reasons, the Committee is recommending this remain an Informational item.

At the NCWM 2015 Annual Meeting, the NIST Technical Advisor remarked that states have different interpretations for Section 1.5. Meat Poultry, Fish and Seafood. Some states believe this is a non-issue and does not need to be addressed through the Conference. Some states were able to work directly with retailers in resolving any issues. A primary concern is the need for uniformity in the marketplace. There are two separate issues; one being the method of sale on prepackaged products; and the second being the method of sale when sold by bulk. NIST Handbook 130 does not provide guidance for some of the marketing practices that are being seen in today's marketplace. NIST also has been in contact with a state that is having issues with markdowns labels. If the NCWM approves the Committee's request that a task group (TG) be formed, NIST would facilitate the TG that will consist of regulatory officials and retailers working together to review this item and provide a recommendation at the 2016 Interim Meeting.

At the 2016 NCWM Interim Meeting, the Committee was provided with language from the Meat, Poultry, Fish and Seafood TG (MPFS TG). Mr. Hal Prince (Florida) remarked that the language submitted by the TG applies to bulk packages but falls short of addressing packaged items. Mr. Prince would like to see the TG continue to work on the task assigned by the Committee. The Committee agreed to move forward the TG language for consideration as a Voting item.

At the 2016 NCWM Annual Meeting, Mr. Alan Walker (Florida) remarked that the language is not clear whether the advertising is for the placard or the label. The Committee reviewed the language and modified Section 1.9.3. Individual Piece Advertising to add "be advertised or displayed to include". The Committee made minor revisions to the language under consideration to address Mr. Walker's comment.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, a NIST Technical Advisor remarked that a MPFS TG was formed and will be chaired by NIST. This TG is comprised of regulatory officials, industry, and trade associations. The goal of the TG is to have a recommendation to the NCWM L&R Committee by the 2016 NCWM Interim Meeting. Several regulators support the work of the TG. A regulator expressed concern with the whole concept, due to potential effects on both products packed and sold on the same premise and wholesale-distribution products and recommended the item be Informational. WWMA recommends that it be an Informational item.

At the 2015 CWMA Interim Meeting, an industry representative remarked that a task group has been formed to address this issue, and representatives from each region will meet to discuss prior to the 2016 NCWM Interim Meeting. CWMA is recommending this be an Informational item.

At the 2015 NEWMA Interim Meeting, a state regulator remarked that with the language "if sold by count," there may be unintended consequences for some of the items included under the new language. Another regulator wanted clarification as to whether the concerns expressed during the 2015 NCWM Annual Meeting were addressed by the MPFS TG. The original submitter of the proposal, Mr. Charles Carroll (Massachusetts), commented that the proposal was originally intended to provide a price-per-pound comparison between a single price-per-piece item with the same item being offered per pound. A retired regulator asked why frozen products such as salmon are priced per piece. He is wondering why fresh cut items should be treated differently than frozen items. He said this issue has come up many times, and the focus in the past has been only for every item to have a weight declaration. Mr. Carroll clarified that in his state, every item must include a price per pound, regardless if it is pre-packaged, frozen or fresh. A state regulator commented he had a concern with the shellfish portion of the proposal, and wants ensure shellfish are excluded. The item is not yet fully developed, and there are still many unanswered questions from the region. NEWMA looks forward to seeing the results of the MPFS TG and recommends that it be an Informational item.

At the 2015 SWMA Annual Meeting, members indicated they would like to see this developed by the MPFS TG. The SWMA recommends this be an Informational item.

At the 2016 NEWMA and CWMA Annual Meeting, both regions believe this item is fully developed and supports it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015)

232-3 I Section 1.12. Ready-to-Eat Food.

Source:
MPFS TG (2016)

Purpose:
Provide clarification in the definition and method of sale for these products.

Item under Consideration:
Amend the NIST Handbook 130, Method of Sale Regulation as follows:

1.12. Ready-to-Eat Food.

1.12.1. Definition - Ready-to-Eat Food. –Restaurant ~~**style**~~ **type** food offered or exposed for sale, whether in restaurants, supermarkets, or similar food service establishments, that is ready for **immediate human** consumption, though not necessarily on the premises where sold**, and which does not require any cooking or heating preparation by the customer.** Ready-to-Eat Food does not include sliced luncheon products, such as meat, poultry, or cheese when sold separately.

Some examples of Ready-to-Eat food items (The list is not intended to be all inclusive.):

- **servings of pastas, potato, or coleslaw;**
- **servings of salads, vegetables, or grains such as rice;**
- **pizzas, whole or sliced;**
- **meat/vegetable pockets/pies;**

- **tacos, fajitas, enchiladas, tostadas;**
- **cooked, whole chickens or turkeys**
- **buckets, tubs, or individual pieces of cooked chicken or fish;**
- **cooked ribs by the slab or piece;**
- **stuffed clams, oysters, shrimp, and fish;**
- **cooked shrimp or crab cakes;**
- **slices of cake, pie, and quiche;**
- **donuts, bagels, and rolls for individual sale;**
- **cookies and brownies for individual sale;**
- **sandwiches, egg, and spring roll;**
- **servings of prepared chili or soup;**
- **stuffed peppers, tomatoes, and cabbage;**
- **knishes; and**
- **pickles.**

NOTE: *The sale of an individual piece of fresh fruit (like an apple, banana, or orange) is allowed by count.*
(Added 2004) **(Amended 20XX)**

1.12.2. Methods of Sale. – Ready-to-Eat Food sold from retail cases displaying product in bulk or in single servings packed or prepared on the premises may be sold by weight, measure, or count (i.e., by piece, portion, or serving) (count includes servings). If pre-packaged, the product shall have the appropriate statement of quantity set forth in the current edition of NIST Handbook 130, Uniform Packaging and Labeling Regulation [UPLR].)
(Amended 1993 **and 20XX)**

Background/Discussion:
The current definition and method of sale is broad and subject to individual (both inspector and establishment) interpretation as to what is considered ready-to-eat. The state of Michigan submitted a proposal at their 2015 CWMA Interim Meeting.

1.12. Ready-to-Eat Food.

1.12.1. Definition - Ready-to-Eat Food. – Restaurant style food offered or exposed for sale, whether in restaurants, supermarkets, or similar food service establishments, that is ready for consumption~~,~~ **and will not require additional cooking preparation by the customer. Consumption may not necessarily be on the premises where sold.** ~~though not necessarily on the premises where sold.~~ Ready-to-Eat Food does not include **bulk deli food or** sliced luncheon products, such as meat, poultry, or cheese when sold separately.

NOTE: *The sale of an individual piece of fresh fruit (like an apple, banana, or orange) is allowed by count.*
(Added 2004) **(Amended 20XX)**

1.12.2. Methods of Sale. – Ready-to-Eat Food ~~**sold from bulk or in single servings packed on the premises may be sold by weight, measure, or count (count includes servings).**~~ **shall be sold from bulk or in single serving packages. Bulk ready-to-eat foods may be sold by random weight or count which includes serving size. Pre-packaged single serving or multi-serving packages shall display a net weight statement representative of the contents, a unit price and a total cost.**
(Amended 1993 **and 20XX**)

At the 2016 NCWM Interim Meeting, the NIST Technical Advisor remarked that the MPFS TG is tasked with reviewing the Method of Sale, Ready to Eat Food requirements. The state of Michigan agreed this proposal should come from the MPFS TG. A MPFS TG member asked that since this has been addressed by the Conference in the past, that past background information be placed into the report.

The following excerpts are from the 1991 and 1992 NCWM Conference reports.

> The Committee is aware that consumer buying habits and food marketing practices are constantly changing. Retail food stores compete with restaurants and fast food outlets in the prepared, ready-to-eat market. The traditional methods of sale required in retail grocery stores for ready-to-eat food items put grocers at a substantial competitive disadvantage compared to restaurants and fast food outlets that sell the same or similar items. An industry representative testified that consumers want to purchase these foods in supermarkets, but find it difficult to relate the cost per pound of a ready-to-eat item in the supermarket to the common method of sale used in a restaurant or fast food establishment (for example, "by each".) The industry indicated that allowing supermarkets to offer ready-to-eat food for sale by the piece would enhance value comparison by consumers. When purchasing ready-to-eat items in the supermarket, most consumers do not compare the price per pound, for instance, to the unprepared product, but rather take the total cost of the meal into consideration. Consumers then compare that price not only to other products in the grocery store, but to the same prepared items they might buy were they dining at a restaurant or purchasing a meal at a fast food establishment. The following list is presented to illustrate a few of the menu item foods that would be included under the definition of ready-to-eat foods. The list is not intended to be all inclusive. Some examples of Ready-to-Eat food items:
>
> - Servings of pastas
> - Cooked, whole chickens or turkeys
> - Bar-b-qued ribs by the slab or piece
> - Stuffed clams, oysters, shrimp, and fish
> - Slices of cake, pie, and quiche
> - Sandwiches, egg, and spring roll
> - Buckets or tubs of chicken or fish
> - Servings of chili or soup
> - Servings of salads, vegetables, or grains such as rice
> - Meat/vegetable pockets/ pies
> - Tacos, fajitas, enchiladas, tostadas
> - Stuffed peppers, tomatoes, and cabbage
> - Knishes
> - Pickles
> - Pizzas, whole or sliced
> - Cookies and brownies
>
> The Committee heard comments during the Interim Meeting that restaurants sell such items by the piece or in small, medium, or large size portions, whereas supermarkets are required to sell them by weight or measure. Representatives from the food industry indicated that supermarkets are not

inclined to sell by the piece any ready-to-eat food items that have traditionally been carried in their delis and sold by weight (such as sliced cold cuts or cheese, and prepared salads). Consumers are familiar and comfortable with the pricing and method of sale of these items, and grocers are reluctant to change the system. According to the Food Marketing Institute (FMI), which represents grocery retailers nationally, the supermarket business is highly competitive. Grocers depend on return business, and therefore most grocers would not risk "shorting" consumers by selling them inconsistent portions when offering ready-to-eat items by the piece. Rather, they would work to employ strict practices and controls to ensure uniform servings. FMI contacted their members from throughout the United States, grocery retailers large and small, regarding the sale of ready-to-eat food. Each agreed that the concerns raised initially by supermarkets in the northeastern part of the country are valid across the country. Retailers told FMI that their consumers would prefer to see ready-to-eat food items priced by the piece so they can easily determine the product's value.

In its deliberations to develop a definition for ready-to-eat foods, the Committee agreed that attempting to limit the definition to only items "prepared on the premises" was unreasonable because it would be impossible to enforce, especially if the term "prepared" is not defined. The Committee took the position that how the products are advertised and sold is the issue to be addressed, not where products are "prepared" or what constitutes "preparation." The Committee recognized that many items sold in restaurants, fast food outlets, and supermarkets are prepared in central kitchens and then distributed to the various retail outlets, and that this is the trend for the future. The Committee also decided that attempting to develop an all-inclusive list of products that could be sold as ready-to-eat food would be difficult because of the wide scope of products; in addition, it would be difficult to keep such a list current.

The NCWM first addressed the issue of ready-to-eat food at the 43rd NCWM in 1958. At that time, the terms "carry out meal" and "menu items" were used to provide illustrations of what the Committee intended to exempt from any specific method of sale. These broad terms allowed the individual jurisdiction to establish, according to its marketplace needs, policies or individual regulations to address which products had to be sold by weight, measure, or count. The key to applying the proposed requirement is to focus on how a product is advertised. For example, if a product is advertised in the same way as a food item is on a restaurant or fast food outlet menu, it could be sold by weight, measure, or count.

The Committee considered the importance of this issue, which is of national significance, and believes that action by the NCWM is needed to provide the States and industry with uniform guidance. The Committee proposed to amend Section 1.12. Ready-to-Eat Food to permit the sale of any ready-to-food by weight, measure, or count (count includes serving sizes such as small, medium, or large) if the food is sold from bulk and is ready for consumption. The proposed definition for "Ready-To-Eat Food" is comparable to the definition for restaurant foods used by the Federal Food and Drug Administration regulations that implement the Nutrition Labeling and Education Act of 1990. At the Annual Meeting, the Committee heard comments that the proposal was not supported by the Central and Northeastern Weights and Measures Associations and several members of industry. Therefore, the item was carried forward as an informational item to allow for additional review and development of alternative proposals.

During the 2016 NCWM Interim Meeting, Mr. Kurt Floren (Los Angeles County, California) recommended that consideration be given to removing the term “serving size” from the language in Section 1.12. Ready to Eat Foods and require items be sold by weight or count. The Committee would like to have the MPFS TG continue to develop this item and recommends this be an Informational item.

At the 2016 NCWM Annual Meeting, the Committee stated that the MPFS TG submitted language for consideration to the Committee on March 23, 2016. The L&R Committee accepted this language and looks forward to receiving feedback from the fall regional meetings.

Regional Association Comments:
At the 2015 CWMA Interim Meeting, a state regulator said this proposal merits further consideration, but does not include such items as rotisserie chicken, pizza, meat, and cheese trays. She would like to see this proposal include these items. There is confusion on what defines the term "single serving." CWMA recommends that it be a Developing item for further vetting by the states and regions.

At the 2015 NEWMA Interim Meeting, a state regulator commented that the language is confusing. Another regulator remarked it is unnecessary and redundant with other sections of NIST Handbook 130. NEWMA did not forward this item to NCWM.

At the 2016 NEWMA Annual Meeting, the Chair commented that recommended language for this proposal was received from the MPFS TG. The NIST Technical Advisor remarked that this group consisted of many weights and measures officials, inspectors, and grocery store chains. The concerns regarding "what is a serving size?" was also defined with assistance from FDA (**http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm217762.htm**). The FDA is tasked by Congress to develop nutritional guidelines on food in the marketplace. Included with the nutritional guidelines is serving size. NEWMA believes this new language is fully developed and recommends it move forward as a Voting item.

At the 2016 CWMA Annual Meeting, the NIST Technical Advisor commented that the MPFS Task Group submitted new language to the National L&R Committee. All were encouraged to review the revised language and provide feedback at the Annual NCWM in July. The CWMA is recommending this be an Informational item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

232-4 V Section 2.4. Fireplace and Stove Wood (See Related Items 260-3 and 260-4)

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Recognize traditional industry labeling practice and eliminate language that appears to conflict with the requirements of the packaging and labeling regulation regarding quantity statements.

Item under Consideration:
Amend the NIST Handbook 130, Method of Sale Regulation 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:

(1) liters, to include fractions of liters; **and may also include a declaration of quantity in terms of:** ~~**or**~~

~~**(2) cubic inches, if less than one cubic foot; or**~~

(**2** ~~**3**~~) cubic **foot or** feet~~, if one cubic foot or greater,~~ to include fractions of a cubic foot.

(Amended 2010 **and 20XX**)

Note: Implementation for the requirement for use of the liter in (1): packages may continue to show the dm^3 ~~-~~ instead of the liter (L) for 3 years after the effective date of this regulation to allow for the use of current packaging inventories.

(Added 2016)

(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 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) liters, to include fractions of liters; **and may also include a declaration of quantity in terms of:** ~~**or**~~

~~**(2) cubic inches, if less than one cubic foot; or**~~

(**2** ~~**3**~~) cubic **foot or** feet~~, if one cubic foot or greater,~~ to include fractions of a cubic foot.

(Added 1998) (Amended 2010 **and 2016)**

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 2010)

(Amended 1976, 1991**,** ~~**and**~~ 2010**, and 2016**)

Background/Discussion:

The submitter stated the adoption of the proposed amendments to the method of sale is needed to recognize the widespread use of a method of sale by many packers, which conflicts with existing requirements. If the current method of sale requirement is rigidly enforced, tens of thousands of packages of firewood in many states that adopt NIST Handbook 130, Uniform Method of Sale of Commodity Regulation would likely be found in violation of that regulation.

There is a sector of the firewood industry that sells chunks and split firewood from many types of trees for use in restaurants and homes for smoking and flavoring foods. Currently, Section 2.4.3.(c). Quantity requires "stove wood pellets or chips" no larger than 15 cm (6 in) to be sold by net weight but the wording specifically excludes flavoring chips.

The types of "chunk" wood may include apple, cherry, mesquite, pecan, oak, chunks of "BBQ wood" and used whisky barrels. Some online sellers offer packages of these varied products for sale by net weight and "approximate" net weight but others sell by volume. Some sites also offer split logs by volume and "wood chunks" by net weight. The variations in the sizes and shapes of the wood being sold for flavoring and cooking are significant (in some advertisements the chunk sizes range from 2.0 inches to 4.5 inches), which may be why some sellers have switched to net weight, perhaps believing they fall under Section 2.4.3.(c) Stove wood pellets or chips. It must be determined if under Section 2.4. Fireplace and Stove Wood, "cooking wood" and "chunks" are included under the terms "flavoring chips" and if the method of sale for those products that according to Section 2.4.3.(d) Flavoring chips must be sold by volume is appropriate, or if they fall under Section 2.4.3.(c) Stove wood pellets or chips which permits sales by net weight. If the latter is preferred, then the subsection should be amended to allow flavoring "chunks" to be sold by net weight.

Based on information from several industry sources and weights and measures officials, the current labeling on packaged firewood has the quantity declared in fractions of a cubic foot (e.g., 0.6, 0.7 and 0.75 cubic feet) and by cubic decimeters (dm^3). The use of these units on these package sizes does not comply with the method of sale requirements in Section 2.4.3. Quantity.

Section 2.4.3. Quantity requires that packages of firewood and flavoring chips less than 1 cu ft to be sold by cubic inches and liters. Sale of packaged natural wood by the cubic foot instead of the required cubic inches appears to be a nationwide traditional sales practice. The labeling by the cubic foot appears to provide consumers with quantity information in a unit of measure they understand and can use in making value comparisons against firewood offered for sale by the cord or fractions of a cord. The OWM recommends that the method of sale be revised to require natural wood to be sold by the cubic foot or fractions thereof, to recognize traditional industry sales practice. No change to the method of sale for flavoring chips and kindling is proposed at this time except to request the interpretation regarding cooking wood and flavoring chunks discussed above.

In 1994 the requirement that packages subject to the UPLR include metric units in their quantity declarations was adopted. At that time, the consensus of the NCWM WG that developed the metric revisions to the UPLR was due to consumers being familiar with the term liter (symbols: l or L) rather than the terms cubic decimeter and its symbol (dm^3) even though the quantities are the same. At that time, the methods of sale for peat moss, pine bark mulch, and other products were revised to require the use of the liter instead of cubic decimeter (dm^3) to facilitate consumer understanding of metric units and quantities by requiring a more familiar metric unit to appear on a wide range of packages and quantities. Today, some 21 years after mandatory use of the liter was first implemented, consumer acceptance and understanding of what a liter is and the amount of product it represents is greater than it was in 1994, so the requirement that metric volumes must appear on labels in terms of the liter should not be changed.

Packages subject solely to the UPLR (i.e., they are not subject to the Federal Fair Packaging and Labeling Act) may be offered for sale only in metric units (customary units may also appear on the principal display panel at the option of the packer.) As currently written in the Method of Sale, Section 2.4.3., subsections (a)(1) and (d)(1) require packages be labeled in "liters, to include fractions of liters or," which may confuse readers by making it appear that liters are only one option for how quantities must be shown. That wording is inconsistent with the declaration of quantity requirement in the UPLR, Section 6.1. General that requires <u>all</u> packages to bear a declaration of quantity in both metric and customary units (an exemption in Section 11.33. of the UPLR makes customary units optional). An editorial change must be made to Section 2.4.3. Quantity for both natural wood and flavoring chips to clarify that a packer must provide a declaration of quantity in metric units in terms of the liter and that U.S. customary units may appear on the package but that they are optional.

If adopted, the amendment to allow sales of packaged natural firewood by the cubic foot will go into effect on January 1 of the year following NCWM adoption. However, since it will take time for packers to learn of the changes and to add metric units to their packaging or change cubic decimeter to liters, a period of three years from the effective date of the revised regulation should be allowed for the changeover.

At the 2016 NCWM Annual Meeting, Mr. Richard Whiting (American Woods Fibers) was in support of this item but noted that flavoring pellets should be added. Ms. Cheryl Ayers (New Hampshire) questioned whether bio bricks in the marketplace would fall under this category. The Committee believes that bio bricks would fall under Section 2.4.3.(b) Artificial compressed or processed logs and recommends this as a Voting item.

At the 2016 NCWM Annual Meeting, Ms. Ayers submitted modified language to the Committee to include bio bricks. The Committee firmly believes that bio bricks would fall under the Section 2.4.3.(b) Artificial compressed or processed logs, since a bio brick is formed from fine scraps of wood and sawdust. The Committee made editorial changes to Section 2.4.3.(a)(**<u>2</u>**) and 2.4.3(d)(**<u>2</u>**) to read "cubic **<u>foot or</u>** feet**~~, if one cubic foot or greater,~~** to include fractions of a cubic foot."

Regional Association Comments:
At the 2015 WWMA Annual Meeting, an industry representative spoke in support of the proposal. The NIST Technical Advisor submitted changes (that appear below) to the proposed language. The changes reflect labeling practices in the marketplace and will correct language that appears to conflict with the requirements of the UPLR, in regards to quantity statements. The WWMA believes this item has merit, and suggests additional industry input is

needed on the method of sale and conversion methods. In additional to the NIST revision the WWMA recommends the Committee also review the following suggested editorial changes: 2.4.3 (a) 1 and 2 be merged into one statement; 2.4.3 (d) 1 and 2 also be merged into one statement. The WWMA is recommended that in the "note" dm^3 should read cubic decimeter (dm^3). The WWMA forwarded the item to NCWM, recommending that it be a Voting item.

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:

(1) liters, to include fractions of liters **or may also include a declaration of quantity in terms of:**

~~**(2) cubic inches, if less than one cubic foot; or**~~

(**2** ~~**3**~~) cubic **foot,** ~~**feet, if one cubic foot or greater,**~~ **to include fractions of a cubic foot**; **or cubic feet** to include fractions of a cubic foot.

Note: Implementation for the requirement for use of the liter in (1): packages may continue to show the dm^3 instead of the liter (L) for three years after the effective date of this regulation to allow for the use of current packaging inventories.

(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 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) liters, to include fractions of liters~~;~~ ~~**and**~~ **or may also include a declaration of quantity in terms of:**

~~**(2) cubic inches, if less than one cubic foot; or**~~

(**2** ~~**3**~~) cubic **foot,** ~~**feet, if one cubic foot or greater,**~~ **to include fractions of a cubic foot**; **or cubic feet** to include fractions of a cubic foot.

(Added 1998) (Amended 2010**, and 20XX**)

At the 2015 CWMA Interim Meeting, a state regulator commented that he was supportive of the proposal with the exception pertaining to "chips, chunks, and logs." He believes there is a need to develop uniformity in package labeling, and the proposal should continue as a Developing item. State regulators were curious about the method of testing, how it will be conducted, and where it will be conducted, hygroscopic nature of the materials, etc. The CWMA forwarded the item to NCWM recommending it be a Developing item.

At the 2015 NEWMA Interim Meeting, the Committee received additional information and modifying language from NIST. A retired regulator was unclear about the terminology that would require every package purchased to be declared in liters. He does not understand why only the measurement of liter is required; it should be in terms of liters or cubic feet. Other regulators agreed with this comment. NEWMA forwarded the item to NCWM with these amendments and the revised language from NIST (refer to the 2015 WWMA Annual report) be a Voting item.

At the 2015 SWMA Annual Meeting, the NIST Technical Advisor requested input regarding the method of sale of "chunk wood." The Committee recommended that a note be added to Sections 2.4.3.(c) and (d) for "chunk wood shorter than 12 inches being sold in volumes of 1 cubic foot or less or be sold by weight." SWMA forwarded their recommendation to add the note regarding chunk wood and recommended this as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

232-5 V Section 2.10. Softwood Lumber

(This item was Adopted.)

Source:
American Lumber Standard Committee (2016)

Purpose:
Correct the treatment of nominal dimensions of softwood lumber and make the language consistent with NIST Voluntary Product Standard PS 20.

Item under Consideration:
Amend NIST Handbook 130, Uniform Method of Sale of Commodities as follows:

2.10. Softwood Lumber. – Applies to softwood boards, timbers, and dimension lumber that have been surfaced~~, but shall not apply to rough lumber, to lumber that has been matched, patterned, or shiplapped~~; **to other products set forth in the latest version of the Department of Commerce, Voluntary Product Standard PS 20-15, "American Softwood Lumber Standard," Tables 1-4; but shall not apply** ~~or~~ to **rough** lumber **or lumber (other than products in the Tables)** remanufactured or joined so as to have changed the form or identity, such as individually assembled or packaged millwork items. "Nominal sizes" **are** ~~for U.S.~~ customary dimensions ~~are size designations used for convenience in describing~~ **to describe** approximate, rather than actual, sizes of lumber. "Nominal sizes" were originally derived from the dimensions of rough lumber before surfacing and are always greater than the actual **or minimum dressed** dimensions; thus, a dry "2 × 4" is surfaced to actual dimensions of 1½ in × 3½ in (38 mm × 89 mm). The requirements in ~~this section~~ **Section 2.10.1. Definitions** refer to actual sizes of lumber**.**~~; for~~ **Examples of** nominal sizes **and minimum dressed sizes for board and dimension lumber are shown in** ~~(see~~ Table 1. Softwood Lumber Sizes~~)~~. **A more complete listing of nominal size categories are found in the latest version of PS 20-15,** ~~The nominal sizes used in this section follow Department of Commerce Voluntary Product Standard PS 20-10,~~ "American Softwood Lumber Standard" **in Tables 1, 2, 3, and 4.** ~~or latest edition. SI equivalents are included for actual measurements only.~~

(Amended 2016)

2.10.1. Definitions.

2.10.1.1. ~~**Surfaced (d**~~**Dressed**~~**)**~~ **Lumber.** – Lumber that has been surfaced by a machine (to attain smoothness of surface and uniformity of size) on one side (S1S), on two sides (S2S), one edge (S1E), two edges (S2E), or a combination of sides and edges (S1S1E, S1S2E, S2S1E, S4S).

(Amended 2016)

2.10.1.2. Boards. – Lumber 38 mm (1½ in) or less in actual thickness and 38 mm (1½ in) or more in actual width. Lumber less than ~~139~~**140** mm (5½ in) in actual width may be classified as strips.

(Amended 2016)

2.10.1.3. Timbers. – Lumber 114 mm (4½ in) or more in smallest dimension. Timbers may be designated as beams, stringers, postscaps, sills, girders, or purlins.

2.10.1.4. Dimension Lumber. – Lumber from 38 mm (1½ in) to, but not including, 114 mm (4½ in) in actual thickness, and 38 mm (1½ in) or more in actual width. Dimension lumber may be designated as framing, joists, planks, rafters or studs.

2.10.1.5. Rough Lumber – Lumber that has not been **dressed ~~surfaced~~**, but that has been sawed, edged, and trimmed at least to the extent of showing saw marks, or other primary manufacturing marks in the wood, on the four longitudinal surfaces of each piece for its overall length.

(Amended 2016)

2.10.1.6. Matched Lumber. – Lumber that has been worked with a tongue on one edge of each piece and a groove on the opposite edge to provide a close tongue and groove joint by fitting two pieces together; when end-matched, the tongue and groove are worked in the ends also.

2.10.1.7. Patterned Lumber. – Lumber that is shaped to a pattern or a molded form, in addition to being dressed, matched, or shiplapped, or any combination of these workings.

2.10.1.8. Shiplapped Lumber. – Lumber that has been worked or rabbeted on both edges of each piece to provide a closelapped joint by fitting two pieces together.

2.10.1.9. Grade – The commercial designation assigned to lumber meeting specifications established by a nationally recognized grade rule writing organization.

2.10.1.10. Species. – The commercial name assigned to a species of trees.

2.10.1.11. Species Group. – The commercial name assigned to two or more individual species having similar characteristics.

2.10.1.12. Representation – A "representation" shall be construed to mean any advertisement, offering, invoice, or the like that pertains to the sale of lumber.

2.10.1.13. Minimum Dressed Sizes (width and thickness). – The standardized width and thickness at which lumber is dressed when manufactured in accordance with the U.S. Department of Commerce Voluntary Product Standard PS 20-**15~~10~~**), "American Softwood Lumber Standard," or latest edition, and regional grading rules conforming to **the latest version of** PS 20-**15~~10~~**) **~~or latest edition~~**. (See Table 1. Softwood Lumber Sizes **containing examples of some minimum dressed sizes**.)

(Amended 2016)

2.10.2. Identity. – Representations shall include a declaration of identity that specifies the grade or grades, species or species group, and whether the lumber is unseasoned (green) or dry.

2.10.3. Quantity. – Representations shall be in terms of:

(a) the number of pieces;

(b) the minimum **dressed ~~surfaced~~** width and thickness**~~; and~~ or actual width and thickness, except that the use of nominal dimensions shall be allowed as long as:**

(1) The term "nominal" or "nom" is also used; and

(2) The actual or minimum dressed sizes are prominently displayed to the customer either by means of a table or label.

(c) either the length of individual pieces or the lineal footage**~~, except that the use of nominal dimensions shall be allowed as long as a table of minimum surfaced sizes is displayed prominently or the actual dimensions are prominently displayed to the customer and the term "nominal" or "nom" is also used in conjunction with any representation of dimensions.~~**

Table 1. Softwood Lumber Sizes

Examples of minimum **dressed** ~~**standard surfaced**~~ sizes at the time of manufacture for both unseasoned green) and dry lumber ~~**as published by the**~~ **in the latest version** of the U.S. Department of Commerce in Voluntary Product Standard PS 20-**15** ~~**10 or latest edition**~~.

Product Classification (Nominal Size)	Minimum Dressed Sizes**			
	Unseasoned		Dry	
Inches	Inches	Millimeters	Inches	Millimeters
Surfaced Lumber*				
2 × 2	$1^{9}/_{16} \times 1^{9}/_{16}$	40 × 40	1½ × 1½	38 × 38
2 × 2½	$1^{9}/_{16} \times 2^{1}/_{16}$	40 × 52	1½ × 2	38 × 51
2 × 3	$1^{9}/_{16} \times 2^{9}/_{16}$	40 × 65	1½ × 2½	38 × 64
2 × 4	$1^{9}/_{16} \times 3^{9}/_{16}$	40 × 90	1½ × 3½	38 × 89
2 × 6	$1^{9}/_{16} \times 5^{5}/_{8}$	40 × 143	1½ × 5½	38 × 140
2 × 8	$1^{9}/_{16} \times 7½$	40 × 190	1½ × 7¼	38 × 184
2 × 10	$1^{9}/_{16} \times 9½$	40 × 241	1½ × 9¼	38 × 235
2 × 12	$1^{9}/_{16} \times 11½$	40 × 292	1½ × 11¼	38 × 286
Board Lumber				
1 × 2	25/32 × 19/16	20 × 40	¾ × 1½	19 × 38
1 × 3	25/32 × 29/16	20 × 65	¾ × 2½	19 × 64
1 × 4	25/32 × 39/16	20 × 90	¾ × 3½	19 × 89
1 × 6	25/32 × 55/8	20 × 143	¾ × 5½	19 × 140
1 × 8	25/32 × 7½	20 × 190	¾ × 7¼	19 × 184
1 × 10	25/32 × 9½	20 × 241	¾ × 9¼	19 × 235
1 × 12	25/32 × 11½	20 × 292	¾ × 11¼	19 × 286

*The dry thicknesses of nominal 3 in and 4 in lumber are 2½ in (64 mm) and 3½ in (89 mm); unseasoned thicknesses are $2^{9}/_{16}$ in (65 mm) and $3^{9}/_{16}$ (90 mm). Widths for these thicknesses are the same as shown above.

PS 20-15**~~10~~ defines dry lumber as being 19 % or less in moisture content and unseasoned lumber as being over 19 % moisture content. The size of lumber changes approximately 1 % for each 4 % change in moisture content. Lumber stabilizes at approximately 15 % moisture content under normal use conditions.

(Added 1971) **(Amended 2016)**

Background/Discussion:
The American Lumber Standard Committee, the Standing Committee for maintenance of the American Softwood Lumber Standard, Voluntary Product Standard 20 ("PS-20") [**gsi.nist.gov/global/docs/vps/approved%20PS20-15%20SSD%20final%202-25-15_dfa%20April%201st_wCover.pdf**], recommends that certain clarifications be made to the Uniform Regulation for the Method of Sale of Commodities, Section 2.10. Softwood Lumber and the Table on page 117 in NIST Handbook 130 (2016).

The NIST, Voluntary Product Standards (VPS) Program acts as an unbiased coordinator, provides editorial assistance, and assures technical soundness. NIST also determines compliance with the criteria of the Department's procedures, provides secretarial functions for VPS Committees appointed under DOC procedures, and publishes the standards as public documents. The use of DOC Voluntary Product Standards is voluntary. NIST has no regulatory power in the enforcement of their provisions; however, since the standards represent a consensus of all interested groups, their provisions are likely to become established as trade customs. In addition, when a Voluntary Product Standard is made a part of a legal document, such as a sales contract or code, compliance with the standard is enforceable.

For some time, there has been confusion in the regulated community as to the specific requirements for the display and advertising of quantity measure for the widths and thicknesses of softwood lumber, particularly when nominal measure is used. This has led to inconsistent labeling in the market and, in some cases, enforcement actions by various state and local weights and measures authorities. These suggested changes would provide greater clarity and make the language internally consistent and consistent with industry terminology. No changes are suggested in the underlying concepts, substantive requirements or practical applications (as we understand them).

Explanation of Specific Changes

1. PS-20 contains four tables with nominal dimensions of different products. It is our understanding that nominal dimensions for these products are accepted by weights and measures officials. NIST Handbook 130 does not include these products in the description of product scope (and indeed even excludes some) and contains information from only one of the PS-20 Tables. The change would make clear that the products in all the PS-20 Tables are all covered.

2. The current Section 2.10. Softwood Lumber indicates that SI equivalents are only used for actual dimensions. In fact, the Table 1 includes metric dimensions for nominal sizes. Other legal authorities require metric. We suggest the sentence be deleted.

3. There is a statement in Section 2.10. Softwood Lumber that the "…requirements of this section refer to actual sizes of lumber." We suggest clarifying that this reference is only to the definitions in Section 2.10.1. Definitions. The section as a whole does include nominal dimensions where indicated.

4. Repositioning the nominal dimension provisions. The nominal dimension provisions are currently in subsection 2.10.3(c) on length. These dimensions relate to width and thickness. We recommend placing them in subsection 2.10.3(b). Quantity.

5. Reformatting of the width and thickness provision — Subsection 2.10.3(b) Quantity (as changed) is altered to make clear that the requirement of displaying the term "nom" or "nominal" when nominal measure is used is applicable with either the disclosure of actual or minimum dressed sizes. The current language with its multiple conjunctions could be read in two different ways.

6. Adding the option for labeling. The current language provides for the use of a "table of minimum surfaced sizes is displayed prominently." In the marketplace, many producers label each piece of lumber. Alternatively, sellers might choose to prominently display a label, rather than a table, to more effectively convey the information to consumers.

7. Consistent use of the term "dressed sizes" rather than "surfaced sizes." Subsection 2.10.1.13. Minimum Dressed Sizes appropriately contains a definition of "Minimum dressed sizes (width and thickness)" and refers to PS-20 as a source for this information. PS-20 similarly uses that term. [1]However, there is inconsistency in other parts of Section 2.10. Softwood Lumber. For example, Subsection 2.10.1.1. defines the term "Surfaced (dressed) lumber." Subsection 2.10.3(b) refers to "minimum surfaced width and

thickness." Subsection 2.10.3(c) uses "minimum surfaced sizes." Table 1 on page 121 of the NIST Handbook 130 (2016) introduces yet another variation with reference to "minimum standard surfaced sizes." We urge that one term "dressed" be consistently used throughout.

8. Table 1 of the section sets forth some, but not all, of the nominal and minimum dressed sizes from PS-20. It is recommended that both Section 2.10. and the Table be revised to indicate that the Table contains examples. Alternatively, all four tables from PS-20(15) could be included.

Section 2.10.1.2. Boards. The dimension for width of dry 1 × 6 board lumber is changed from 139 mm to 140 mm to be consistent with PS-20. (The actual conversion is 139.7 mm.)

[1] See, PS-20, Sections 3.3.1, 3.3.1.1, 3.3.1.2, 3.3.2, 3.3.3, 3.4.4, and Tables 1 - 4. Although Section 3.3.2 is titled Dressed (surfaced) lumber, "dressed" is used alone in all of the other sections.

At the 2016 NCWM Interim Meeting, it was noted that this item was submitted by the American Lumber Standards Committee and not the NIST, OWM as noted inNCWM Publication 15 (2016). The Committee recognizes the need to align the language between the standard and NIST Handbook 130, and recommends this as a Voting item.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Brock Landry, (General Counsel for the American Lumber Standard Committee [ALSC]), provided an overview of the proposed changes and reasons for the changes, which is for clarification purposes. A regulator supported the changes as they would harmonize the language and not change the way weights and measures officials enforce the lumber standard. WWMA believes the item would improve store labeling practices and forwarded the item to NCWM, recommending it be a Voting item.

At the 2015 CWMA Interim Meeting, a state regulator indicated the need to hear more details about this item. It is unclear whether it is fully developed. Consequently, the Committee recommended it be a Developing item.

At the 2015 NEWMA Interim Meeting, there were no comments heard. NEWMA believes it is fully developed and forwarded it to NCWM with the recommendation it be a Voting item.

At the 2015 SWMA Annual Meeting, Mr. Landry provided a presentation that gave an overview of the proposal and how it clarifies the current language, but does not change the content, and also aligns with the NIST Voluntary Product Standard (PS 20-15). The SWMA believes this item is fully developed and forwarded it to NCWM, recommending that it be a Voting item.

At the 2016 NEWMA Annual Meeting, a state weights and measures official remarked that the term "surface" is crossed out and "dressed" is added, but not throughout the proposal. He asked the difference between the two terms. A NIST Technical Advisor added that this language is intended to harmonize the PS 20-15 Voluntary Product Standard with NIST Handbook 130. The NIST Technical Advisor will check with the American Lumber Standards Committee regarding the term "dressed." The NIST Technical Advisor reported that the American Lumber Standards Committee remarked that the terms "dressed" and "surface" mean the same thing. At its 2016 Annual Meeting, NEWMA believed that this item is fully developed and should remain a Voting item.

At the 2016 CWMA Annual Meeting, no comments were heard on this item and the Committee feels it is fully developed and ready for a Vote.

232-6 V Section 2.17. Precious Metals

(This item was returned to the Committee.)

Source:
Florida (2016)

Purpose:
Provide critical information consumers should have when deciding to sell items containing precious metals.

Item under Consideration:
Amend the NIST Handbook 130, Method of Sale Regulation as follows:

2.17. Precious Metals.

2.17.1. Definition.

2.17.1.1. Precious Metals. –Gold, silver, platinum, or any item composed partly or completely of these metals or their alloys and in which the market value of the metal in the item is principally the gold, silver, or platinum component.

2.17.2. Quantity. – The unit of measure and the method of sale of precious metals, if the price is based in part or wholly on a weight determination, shall be either troy weight or SI units. ~~**When the measurement or method is expressed in SI units of mass, a conversion chart to troy units shall be prominently displays so as to facilitate price comparison.**~~ **To facilitate price comparison and provide information allowing consumers to make an informed decision a chart must be prominently displayed and present in proximity to the purchasing scale being used for the transaction. This chart requirement is not intended to apply to pure precious metals traded on commodity markets such as stock exchanges and the like rather it is only intended to apply to precious metals purchased by second hand markets. The chart must be clearly visible to the seller and contain at a minimum the following information.**

(a) A table of troy weights indicating grains, pennyweights, and troy ounces.

(b) The percentages as noted in Table 3 of precious metals contained in common mixtures found in the marketplace.

Table 3. Percentage of Precious Metal Contained in Mixtures		
Gold	**10 karat**	**41.7 %**
	14 karat	**58.3 %**
	18 karat	**75.0 %**
	24 karat	**100.0 %**
Silver	**Sterling**	**92.5 %**
Platinum	**900 platinum**	**90.0 %**
	950 platinum	**95.0 %**

(c) If buying precious metals based on weight the chart shall also state the minimum percentage of the current melt value being used to calculate the buying price and the minimum melt value on which the buying price is based.

(d) If buying precious metals based on weight the following formula:

"(Item weight × Percentage in decimal form of precious metal contained in the item) × (Melt value being used × Percentage in decimal form being paid of melt value being used) = Potential Monetary Offer."

(e) When the measurement or method of sale is expressed in SI units of mass, a conversion chart to troy units must also be present on the chart.

(Added 1982) **(Amended 20XX)**

Background/Discussion:
The accurate and fair purchase of precious metals by retailers from the general public is dependent on two primary factors. The first factor being the accuracy of the scale, which is well covered in Section 2.20. of NIST Handbook 44.

The second factor has not been addressed, but it involves the calculation or method used by buyers to make an offer to the seller (the general public). Because the average consumer is unaware of how to calculate market value for their precious metal containing items (e.g., gold and silver jewelry, etc.), the potential for an inequitable or uniformed transaction exists despite an accurate scale. The weights and measures community routinely refers to the quintessential (and justified) need for "equitable transactions" and if the general public elects to sell precious metals in a time of need or for whatever reason they should have sufficient information to ensure value comparison and be able to engage in an equitable transaction. We believe this additional information will further ensure equitable transactions occur in the precious metal buying market (from the general public).

Florida officials are aware of scenarios where consumers were paid as low as 10 % of the melt value. Their suspicion is that they were unaware they were being paid such a low percentage of the melt value for their property. The officials believe it is difficult for consumers to discern whether they are being offered a fair price for their items, and the proposed information will help make it less difficult. Secondhand dealers and pawn shops may not be in favor of the additional declarations, but there is no additional cost or requirement to these businesses. Pursuant to existing language (since 1982) charts are already required.

At the 2016 NCWM Interim Meeting, Dr. Matt Curran (Florida) provided background information as to why this proposal was submitted. He believes providing consumers with this information will help them when making a precious metals transaction. The Committee encourages the submitter to reach out to notify stakeholders of this change. The Committee believes this item has importance for marketplace transactions and recommends this move forward as a Voting item.

At the 2016 NCWM Annual Meeting, Dr. Curran remarked that the intent of this proposal is to address secondhand and pawn shops. This requirement is not intended for precious metals traded on the commodity market. There was discussion from the regions regarding the marketplace and how precious metals are sold in their region. It was remarked that terminology needs to be defined for the terms "meltdown, salvage, and secondhand market)." Ms. Julie Quinn (Minnesota) commented that language needs to include the salvage pricing offering and the chart should include grams. At the voting session, Dr. Curran modified the language:

NOTE: This requirement is not intended to apply to pure precious metals traded on commodity markets, such as stock exchanges and the like

2.17.2. Quantity. – The unit of measure and the method of sale of precious metals, if the price is based in part or wholly on a weight determination, shall be either troy weight or SI units. **To facilitate price comparison and provide information allowing consumers to make an informed decision a chart must be prominently displayed and present in proximity to the purchasing scale being used for the transaction. ~~The~~ This chart requirement is not intended to apply to pure precious metals traded on commodity markets such as exchanges and the like, rather, it is intended to apply to pure precious metals purchased by secondhand markets. The chart must be clearly visible to the seller and contain at a minimum the following information: ~~When the measurement or method of sale is expressed in SI units of mass, a conversion chart to troy units shall be prominently displayed so as to facilitate price comparison. The conversion chart shall also display a table of troy weights indicating grains, pennyweights, and troy ounces.~~**

The Committee concurs with the modified language with removal of the Note. The modified language was not adopted and returned to the Committee.

Regional Association Comments:
At the 2015 SWMA Annual Meeting, Dr. Curran stated that this language will give the consumer information that is needed to make a value comparison. A state official was concerned about the size of the chart; however, it was explained that the information could be included on the weight conversion chart that is already required. Another state official expressed concern that enforcement of this requirement might not be within the purview of weights and measures officials. The SWMA believes this item has merit and would like to get feedback from the other regions. SWMA forwarded the item to NCWM recommending that it be an Informational item.

At the 2016 NEWMA Annual Meeting, a Maine weights and measures official commented that they support this item and believe there is a significant need for this new language. A retired weights and measures official commented he

had concerns with vagueness in Table 3 – conversion factors need to be stated and clarified. A state official commented that this chart is already adopted in NIST Handbook 44. Another state official asked for clarity regarding the term "melt value." Another state official asked if this new language would impact the precious metals commodity market. A retired individual commented that Section 2.17.2. Quantity clarifies that this provision is dealing with recycled scrap gold. He suggested that a paragraph be added that clarifies metals in pure form would be exempt from this provision. NEWMA supports this as a Voting item with the recommendation the submitter of the proposal add language clarifying a precious metals exemption in a non-retail environment.

At the 2016 CWMA Annual Meeting, a NIST Technical Advisor commented that the submitter was asked by the National L&R Committee to seek additional stakeholder input. CWMA members were also encouraged to review the proposal with stakeholders and provide additional input. However, the Committee feels the item is fully developed and ready for Voting status unless subsequent concerns arise.

232-7 V Section 2.23. Animal Bedding

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2015)

Purpose:
Provide a uniform method of sale for animal bedding that will enhance the ability of consumers to make value comparisons and will ensure fair competition.

Item under Consideration:
Amend the NIST Handbook 130, Method of Sale Regulation 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. Compressed animal bedding packages shall not include pre-compression volume statements.**~~

~~**Example:**~~

~~**250 mL expands to 500 mL (500 in^3 expands to 1000 in^3).**~~

2.23.1. Definition.

(a) Compressed Animal Bedding – means that the volume of the bedding was reduced under pressure during the packaging process.

(b) Useable Volume – the volume of the product that can be recovered from a package by the consumer after it is unwrapped and, if necessary, uncompressed.

2.23.2. Method of Sale.

(a) Packaged animal bedding of all kinds, except for baled straw, shall be advertised, labeled, offered for sale and sold by volume in either a compressed or a uncompressed package. A packaged of compressed animal bedding shall be advertised, labeled, offered and exposed for sale and sold on the basis of the "Useable Volume." If unit pricing is provided for use by retail customers to make a value comparison it shall be in terms of the price per liter.

(b) A quantity declaration shall be in terms of the largest whole unit of the milliliter, liter, or cubic meter. A declaration may also include the quantity in terms of largest whole unit of

the cubic inch, cubic foot, or cubic yard only. The terms "Useable Volume" must appear in the quantity declaration on a package of compressed animal bedding.

Examples for Uncompressed Animal Bedding:
Volume 41 Liters (1.4 Cubic Feet)
Volume 125 Liters

Examples for Compressed Animal Bedding:
Useable Volume 1.4 Cubic Feet (41 Liters)
Useable Volume 27.9 Liters (1700 Cubic Inches)
Useable Volume 113 L (4 Cubic Feet)

Useable Volume 226 L

(c) The display of a net or gross weight, pre-compression volume, compressed volume, or supplementary dry measure quantities (e.g., dry pint, dry quart, or bushel) anywhere on the package is prohibited.

(Added 2016)

2.23.~~1.~~3. Exemption - Non-Consumer Packages of Animal Bedding Sold to Laboratory Animal Research Industry. – Packaged Animal Bedding consisting of granular corncobs and other dry (8 % or less moisture), pelleted, and/or non-compressible bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government, medical, university, preclinical, pharmaceutical, research, biotech, and research institutions) may be sold on the basis of weight.

(Added 2010)

Note: This method of sale for animal bedding shall be enforceable after January 1, 2018.

(Added 2016)

Background/Discussion:
This proposal provides amendments to NIST Handbook130, Uniform Method of Sale, Section 2.23. Animal Bedding. These changes were determined necessary when a proposal was drafted to revise the test procedures within NIST Handbook 133, Chapter 3. Section 3.9. **Dimensional Test Procedure for Verifying the Compressed Quantity Declaration on Packages of** Peat Moss **and Animal Bedding** and a new proposal was created to add **Section 3.15. Test Procedure for Verifying the Expanded Volume Declaration on Packages of Animal Bedding** (refer to Item 260-5 in NCWM Publication 15 (2016).

At the 2015 NCWM Interim Meeting, support was heard in favor for this proposal. It was agreed that the compressed statement is meaningless to the end users. The NIST Technical Advisor noted, if this item moved forward to remove the term compressed, it would impact the language in Item 260-2 (NCWM Publication 15 [2015]), NIST Handbook 133, Section 3.9. **Dimensional Test Procedure for Verifying the Compressed Quantity Declaration on Packages of** Peat Moss **and Animal Bedding.** The NIST Technical Advisor remarked that the background information is being formatted by NIST, OWM, and advised that no technical changes were being made and would be resubmitted with NCWM Publication 16 (2015). Refer to 2015 NCWM Interim Meeting, Report, Appendix C. for the Executive Summary, additional background and supporting information for "Testing Packages of Animal Bedding and Peat Moss with Compressed and Expanded Volume Declarations." The Committee agreed to move this forward as a Voting item.

At the 2015 NCWM Annual Meeting, the NIST Technical Advisor submitted the following changes to the Item under Consideration:

- 2.23.1.(a) added the language: **including pet or stall bedding, cat or pet litter, or simply bedding.**
- Change the term "expanded volume" to read "usable volume."
- Moved the examples in 2.23.2.(c) to 2.23.2.(b).

- Section 2.23.2.(c) add the term **or weight**.
- Add the following: ***Note: This method of sale for animal bedding shall be enforceable after January 1, 2018.***

During open hearings, it was discussed that adding the term "cat litter" to the definition of animal bedding may not be appropriate. It was suggested that only wood shavings and paper products be used for animal bedding under the method of sale and test procedure. Along with the method of sale for kitty litter, there were questions regarding the MAV and the test procedure for cat litter. The Committee modified two areas of the Item Under Consideration:

- **2.23.1. Definitions.**

  Animal Bedding – Packaged animal bedding of all kinds, except for baled straw. ~~**any material, except for baled straw kept, offered or exposed for sale or sold for primary use as a medium for any companion or livestock animal to nest or eliminate waste, including pet or stall bedding, cat or pet litter, or simply bedding.**~~

- Section 2.23.2.(c) strike the term ~~**or weight**~~.

The Committee changed the status of this item to Informational and is recommending further development of the following:

- Section 2.23.1.(b) review the definition of "Usable" volume for ALL types of animal bedding, including uncompressed. Substrate type products may not be the correct term for this section.
- Need to define the term "compressed form."
- Section 2.23.2.(c) add the term "or weight" to supplemental units.
- Determine if the enforceable date works for manufacturers.
- Review of the test procedure (Item 260-3)

At the 2016 NCWM Interim Meeting, it was noted that NIST sent a document to all the fall regional meetings addressing any concerns that were previously brought up on this proposal. The Committee reviewed the regional reports on this item and will be moving forward the modified language provided by NIST.

At the 2016 NCWM Annual Meeting, it was recommended that the term "Compressed Bedding" read "Compressed Animal Bedding" for better clarity. The Committee moved forward an enforceable date of January 1, 2018, which will allow manufacturers two years to comply.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, the NIST Technical Advisor addressed the concerns that were raised at the 2015 NCWM Annual Meeting. NIST submitted revised language (refer to 2015 SWMA Annual Report archive **https://www.ncwm.net**), which excludes cat litter and has additional editorial changes. An industry representative fully supported this item. A regulator also commented that his jurisdiction fully supports this item, and this is a good example of industry and regulators working together. WWMA recommends using the revisions that NIST proposed along with some minor amendments to that language. The item is fully developed and all the language that was previously objectionable has been corrected. The WWMA recommends this proposal be made a Voting item at the NCWM Interim Meeting.

2.23.1. Definition.

(a) Compressed Bedding – ~~**means that**~~ the volume of the bedding **that** was reduced under pressure during the packaging process.

At the 2015 CWMA Interim Meeting a state regulator indicated he wanted to ensure pet litter was not included in the proposal. Another state regulator commented that she would support moving this item to Voting status, if it does not include pet litter. A state regulator questioned how cubic feet would be applicable for a pelletized product. A state regulator questioned whether the product should be sold by liter only. The group discussed the need for clarity with

regards to customary units of measure versus "liter only" versus unit pricing. Given the uncertainty related to the inclusion of pet litter and the need for clarity related to the method sale, the CWMA recommended that this item be a Developing item.

At the 2015 NEWMA Interim Meeting, it was reported there were some minor questions regarding the language, but the key issue was clear and recommended that this be a Voting item.

At the 2015 SWMA Annual Meeting, a NIST Technical Advisor provided the following language to be considered. The SWMA recommends that this item be a Voting item with these proposed changes incorporated.

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. Compressed animal bedding packages shall not include pre-compression volume statements.**~~

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

2.23.1. Definition.

(a) Compressed Bedding – means that the volume of the bedding was reduced under pressure during the packaging process.

(b) Useable Volume – the volume of the product that can be recovered from a package by the consumer after it is unwrapped and, if necessary, uncompressed.

2.23.2. Method of Sale.

(a) Packaged animal bedding of all kinds, except for baled straw, shall be advertised, labeled, offered for sale and sold by volume in either a compressed or a uncompressed package. A packaged of compressed animal bedding shall be advertised, labeled, offered and exposed for sale and sold on the basis of the "Useable Volume." If unit pricing is provided for use by retail customers to make value comparisons, it shall be in terms of the price per liter.

(b) A quantity declaration shall be in terms of the largest whole unit of the milliliter, liter, or cubic meter. A declaration may also include the quantity in terms of largest whole unit of the cubic inch, cubic foot, or cubic yard only. The terms "Useable Volume" must appear in the quantity declaration on a package of compressed animal bedding.

Example for Uncompressed Animal Bedding:
Volume 41 Liters (1.4 Cubic Feet)
Volume 125 Liters

Examples for Compressed Animal Bedding:
Useable Volume 1.4 Cubic Feet (41 Liters)
Useable Volume 27.9 Liters (1700 Cubic Inches)
Useable Volume 113 L (4 Cubic Feet)
Useable Volume 226 L

(c) The display of a net or gross weight, pre-compression volume, compressed volume, or supplementary dry measure quantities (e.g., dry pint, dry quart, or bushel) anywhere on the package is prohibited.

2.23.~~1.~~3. Exemption - Non-Consumer Packages of Animal Bedding Sold to Laboratory Animal Research Industry. – Packaged Animal Bedding consisting of granular corncobs and other dry (8 % or

less moisture), pelleted, and/or non-compressible bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government, medical, university, preclinical, pharmaceutical, research, biotech, and research institutions) may be sold on the basis of weight.

At the 2016 NEWMA Annual Meeting, Mr. Mike Sikula (New York) supported both the method of sale and test procedure for animal bedding and prefers a change in the test procedure (Item 260-5) to take nine measurements across the surface to measure the depth of the product. NEWMA considers this item to be fully developed.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP S1210, 2015).

232-8 V Section 2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel

(This item was Adopted.)

Source:
Clean Vehicle Education Foundation (2014)

Purpose:
Since natural gas is sold in the retail market place as compressed natural gas (CNG) to be an alternative fuel to gasoline and diesel fuel and as liquefied natural gas (LNG) to be an alternative fuel to diesel, the proposed additions and edits to NIST Handbook 130 will provide definitions for natural gas equivalents for diesel liters and diesel gallons so end users can readily compare cost and fuel economy. At present, only CNG equivalents for gasoline are included in the handbooks.

Item under Consideration:
Amend the NIST Handbook 130, Method of Sale Regulation as follows:

2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel.

2.27.1. Definitions.

2.27.1.1. Compressed Natural Gas (CNG). – A gaseous fuel composed primarily of methane that is suitable for compression and dispensing into a fuel storage container(s) for use as an engine fuel.

(Amended 2016)

~~**2.27.1.2. Gasoline Liter Equivalent (GLE).** – **Gasoline liter equivalent (GLE) means 0.678 kg of natural gas.**~~

2.27.1.2.~~3.~~ Gasoline Gallon Equivalent (GGE). – Gasoline gallon equivalent (GGE) means 2.567 kg (5.660 lb) of **compressed** natural gas.

(Amended 2016)

2.27.1.3. Diesel Gallon Equivalent (DGE). - Diesel gallon equivalent means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.

(Added 2016)

2.27.1.4. Liquefied Natural Gas (LNG). – Natural gas which is predominantly methane that has been liquefied at − 162 °C (− 260 °F) at 14.696 psia and stored in insulated cryogenic fuel storage tanks for use as an engine fuel.

(Added 2016)

2.27.2. Method of Retail Sale and Dispenser Labeling.

2.27.2.1. Method of Retail Sale. – All **compressed** natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline ~~**liter equivalent (GLE), or gasoline**~~ gallon equivalent (GGE), **diesel gallon equivalent (DGE) units or mass.**

(Amended 2016)

2.27.2.2. Dispenser Labeling Compressed Natural Gas. – All retail **compressed** natural gas dispensers shall be labeled with the **equivalent** conversion factor in terms of ~~**kilograms or**~~ pounds **(lb).** The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have ~~**either**~~ the statement "1 Gasoline Gallon Equivalent (GGE) ~~**is equal to**~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** consistent with the method of sale used.

(Amended 2016)

2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel l gallon equivalent (DGE) units, or mass.

(Added 2016)

2.27.2.4. Dispenser Labeling of Retail Liquefied Natural Gas. – All retail liquefied natural gas dispensers shall be labeled with the equivalent conversion factor in terms of pounds (lb). The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas."

(Added 2016)

Background/Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of compressed natural gas (CNG) vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit for both Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG), and both products are measured in mass. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of LNG for heavy-duty vehicles in these convenient units. (Refer to the "Report of the 99th National Conference on Weights and Measures*"* [SP 1193, 2014] for the mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE.)

At the NCWM 2014 Interim Meeting, Mr. Mahesh Albuquerque (Chair, National Gas Steering Committee [NGSC]) notified the Committee that this item is being developed by the NGSC. The Committee noted that the factor in 2.27.1.6. Liquefied Natural Gas should not read − 126.1 °C but rather – 162 °C.

The L&R Committee, in responding to the NGSC's June 10, 2014, request to change the NGSC's March 2014 recommendation for DGE units to the following: The L&R Committee agreed that the CNG and LNG conversion factors proposed for use in converting these gases to DGE units should be revised in the 2014 Interim Report so that their numerical values are expressed to three decimal places rather than two decimal places. These changes are reflected in the following proposed modifications within Section 2.27. Retail Sales of Natural Gas Sold as Vehicle

Fuel to read: 1 Diesel Gallon Equivalent (DGE) is ~~6.380~~ 6.384 lb of Compressed Natural Gas and 1 Diesel Gallon Equivalent of Liquefied Natural Gas is ~~6.060~~ 6.059 lb.

At the NCWM 2014 Annual Meeting, a joint session was held with L&R and S&T Committees to hear comments on this item. It was noted that if the L&R did not move Item 232-3 forward then there would be no reason to proceed with Item 237-2 and S&T Item 337-2 as it appeared in the "Report of the 98th National Conference on Weights and Measures." There was discussion regarding the term "approximately equal" in Sections 2.27.2.2. and 2.27.2.4. It was noted this term was not a measurement equivalency but equal to an energy content. It was recommended that the Committee give consideration to amend the definition and clarify the meaning. Some spoke in opposition saying this item would cause consumer confusion in the marketplace if adopted. Several members questioned where the IRS obtained the numbers that are used in the IRS tax form referenced in the conversion value justification. NIST provided an alternative proposal to the item and several members believed this proposal should be taken into consideration. Since the proposal from the NGSC was not released until June 10, 2014, members felt they did not have enough time to vet the modification or the NIST proposal. The Committee reviewed numerous letters in support of the three items being considered here.

Mr. Ethan Bogren, NGSC Chair, provided the following write up from their NGSC's meeting on January 14, 2015.

Natural Gas Steering Committee Update Report – January 14, 2015
The NGSC has been working diligently at achieving a compromise proposal regarding the sale of CNG/LNG as an alternative motor fuel. While the group has found success in establishing a consensus opinion in many aspects of the regulations, the group remains divided as to what unit of measure should be used for primary method of sale.

As you all know, there has been a proposal submitted urging NCWM to adopt gallon equivalent units (GGE/DGE) as the primary method of sale for natural gas products to be used as an alternative motor fuel. There has been a feeling by many members of the NCWM that this would be considered a diversion from the customary units in which commodities are sold in the United States causing concern.

Since a consensus regarding the units used for the primary method of sale for natural gas products was unable to be achieved, the NGSC is prepared to submit two proposals to the L&R and S&T Committees for comment and review. It was agreed by NGSC members that this was the only fair way to represent the group as a whole.

While both proposals have many similarities, I would like to summarize the major differences regarding the method of sale as it pertains to each document.

Volume Equivalent Compromise Version: CNG/LNG shall be measured in mass and indicated in gallon equivalent units unless the weights and measures official having jurisdiction mandates otherwise through local regulation. This would make GGE/DGE units the only unit of quantity required to be displayed on the dispenser during a retail transaction.

Mass Compromise Version: CNG/LNG shall be measured in mass and indicated in mass. The display of supplemental information would also be permitted on the dispenser. This would allow GGE/DGE units to be indicated on the dispenser display face as long as it is stated the GGE/DGE units are for value comparison purposes only.

There is a willingness to accept equivalent units for advertising purposes such as street signs.

The NGSC is confident that a compromise will be found with the guidance of the S&T and L&R Committees. Along with input coming from the floor during Open Hearings during the NCWM Interim Meeting a sense of which proposal best represents the body of the National Conference of Weights & Measures may be determined.

NCWM 2015 Interim Meeting: A joint session was held with the L&R and S&T Committees to hear this item along with Item 237-1 of the L&R report and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T report.) Two proposals were addressed. Proposal One, titled "the Volume Equivalent Compromise" requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal Two, titled "The Mass Compromise" would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison.

Proposal One, Volume Equivalent Compromise Version was supported by industry representatives and several weights and measures officials. Some reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacture dispensers that can indicate in both mass and equivalent gallons.

Proposal Two, Mass Compromise Version was supported by numerous weights and measures officials who favor a "traceable unit." Equivalent values are not NIST traceable units of measurement. The equipment currently is able to indicate in mass units. There are several products that allow for supplemental information to be posted (e.g., paint and fertilizer.) Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter, because it may affect future proposals brought before the Conference. The NIST S&T Technical Advisor requested that FALS review the references and data that was used to determine the values on the equivalent units. The FALS has agreed to put together a WG and provide additional feedback on this area.

The L&R Committee agreed to move Proposal One, "Volume Equivalent Compromise" version with revisions as addressed during the NGSC work session and open hearings. The Committee modified the language in Section 2.27.2.1. and 2.27.2.3. to add the language "or mass" to the last sentence in each section and moved this forward as a Voting item.

> **2.27.2.1. Method of Retail Sale.** – All **compressed** natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline liter equivalent (GLE)**, ~~or~~** gasoline gallon equivalent (GGE)**, diesel liter equivalent (DLE), ~~or~~ diesel gallon equivalent (DGE) units, or mass.**
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> **2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel liter equivalent (DLE), ~~or~~ diesel gallon equivalent (DGE) units, or mass.**

2015 NCWM Annual Meeting: A joint session was held with the L&R and S&T Committees to hear this item along with Item 237-1 of the L&R report and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T Committee report.) Mr. Matthew Curran (FALS Chair) provided the following modifications to the language as it appeared in NCWM Publication 16 (2015):

Under 2.27.1. Definitions (note renumbering of sections will be done editorially by NIST)

- Delete in its entirety Section 2.27.1.2. Gasoline Liter Equivalent (GLE).
- Under 2.27.1.3. remove metric equivalent 2.567 kg.
- Delete in its entirety Section 2.27.1.4. Diesel Liter Equivalent (DLE).

Under 2.27.2. Method of Retail Sale and Dispenser Labeling

- Under this section strike the term "is equal to" and replace with "means."
- Under 2.27.2.1. strike the terms equivalent (GLE) or gasoline. Strike diesel liter equivalent (DLE).
- Under 2.27.2.2. strike the term "kilogram." Strike "1 Gasoline Liter Equivalent (GLE) is equal to means 0.678 kg of Natural Gas."
- Under 2.27.2.3. strike the term "liter equivalent (DLE), diesel."
- Under 2.27.2.4. strike the term "kilogram (kg) or". Strike "1 Diesel Liter Equivalent (DLE) **~~is equal to~~ means 0.726 kg of Liquefied Natural Gas" or**. In the last sentence strike "**consistent with the method of sale used."** Change the term "and" to "or" **Compressed Natural Gas" ~~and~~ or "1 Diesel Gallon Equivalent (DGE).**

The Committee acknowledged receiving letters in support of this proposal and that the majority of comments made during the open hearings were also in support of the proposal. It was noted that measurement principles, value comparisons, traceability (**Note:** equivalents are not traceable) need to be analyzed. It is difficult to work with equivalent values that fluctuate in value. There is a task group under the FALS that is currently looking at the equivalent numbers. It was also questioned whether both proposals were reviewed and considered in detail. A corrected document was received for Appendix A, Background and Justification for NIST Handbook 130, Definition of "Diesel Gallon Equivalent (DGE)" of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel.

A majority of the Committee believes that the changes submitted during open hearings are fully developed and will align with language proposed in S&T Item 337-1. The language changes support clarifying that two types of natural gas exist as a motor vehicle fuel [compressed and liquefied]. Additionally, the proposal makes it clear that the method of sale for compressed natural gas may be either GGE, DGE, or mass, and for liquefied natural gas the method of sale may be DGE or mass; however, all natural gas sold as a vehicle fuel shall be measured in mass. This item along with Item 237-1 and S&T Item 337-1 received a split vote, therefore it was returned to the Committee.

At the 2016 NCWM Interim Meeting, a joint session was held with the S&T Committee to discuss combined Natural Gas items. It was agreed that a device requirement reflected in NIST Handbook 44 would require all printed receipts to include a statement of total quantity delivered in terms of mass when gallon equivalent units are used as the primary method of sale. Dr. Curran (Florida) remarked that the SWMA has provided compromised language in their fall regional report and urges the Committee to make this a Voting item. Mr. Randy Moses (Wayne) stated they will not be manufacturing dual level displays and this would affect all point of sale devices. Mr. Ross Anderson (retired New York Director) stated that the buyer and seller decides how a product is sold, over time this becomes tradition, and this determination is not a weights and measures role. Several state directors and stakeholders recommended that the Committee move the language in the current publication forward as a Voting item. A NIST Technical Advisor again reiterated the NIST Technical Analysis of S&T Item 337-1 is on the NCWM website. Ms. Angela Godwin (Ventura County, California) prefers the NIST language proposal but believes the SWMA has language that is fair and consistent. Mr. Ron Hayes (Missouri) remarked that the entire world sells natural gas by mass. We may mislead the public if we allow equivalent units. The Committee reviewed all comments and recommended that the language in NCWM Publication 15 moved forward as a Voting item.

At the 2016 NCWM Annual Meeting, a joint open hearing session was held with S&T Committee to hear testimony on the NCG/LNG agenda items. Mr. Jeff Clarke remarked that the Conference should adopt a uniform standard that is used by all states. Mr. Randy Moses suggest changing the language to have the conversion at the end of the receipt in mass. NIST/OWM submitted a technical analysis to the Committee that expresses that a method of sale should provide uniformity, transparency, and accuracy. Ms. Butcher also discussed weights and measures principles, limited supporting data, supplemental information, among many other factors to be reviewed when considering this item. Dr. Curran (FALS Chair) remarked that there is a CNG/LNG Equivalent Values informal focus group but they do not have an official position. Some states expressed support for this item and remarked this is what their customers are supporting. Several states remarked that they currently have in law that permit these fuels to be sold by equivalent units. Some commented that this needs to align with the current tax regulation. Again, the topic of the dual display was discussed as well as whether this would cause consumer confusion.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, there was support from seven regulators for this to be a Voting item. One regulator objected to the fact that it violates weights and measures principles and referred the audience to the NIST, OWM Technical Analysis document against the use of equivalent units for natural gas. Another regulator would like a grandfather period of ten years and then a conversion to mass units on dispensers and advertising. WWMA believes this item is fully developed with the recommended amendments to Section 2.27.2.2. Dispenser Labeling and 2.27.2.4. Dispenser Labeling of Retail Liquefied Natural Gas), which emphasizes that the dispenser labeling is only needed when the equivalent units are used (not necessary when indications are in mass). WWMA recommended that this item be a Voting item as amended below:

2.27.2. Method of Retail Sale and Dispenser Labeling.

2.27.2.1. Method of Retail Sale. – All **compressed** natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline ~~**liter equivalent (GLE), or gasoline**~~ gallon equivalent (GGE), **diesel gallon equivalent (DGE) units or mass.**

2.27.2.2. Dispenser Labeling Compressed Natural Gas. – All retail **compressed** natural gas dispensers **indicating in equivalent units** shall be labeled with the **equivalent** conversion factor in terms of ~~**kilograms or**~~ pounds **(lb).** The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have ~~**either**~~ the statement "1 Gasoline Gallon Equivalent (GGE) ~~**is equal to**~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** consistent with the method of sale used.

2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel l gallon equivalent (DGE) units, or mass.

2.27.2.4. Dispenser Labeling of Retail Liquefied Natural Gas. – All retail liquefied natural gas dispensers indicating in equivalent units shall be labeled with the equivalent conversion factor in terms of pounds (lb). The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas."

(Amended 20XX)

At the 2015 CWMA Interim Meeting, an industry representative from National Association of Convenience Stores (NACS), National Association of Truck Stop Operators (NATSO), Petroleum Marketers Association of America (PMAA) and Society of Independent Gasoline Marketers of America (SIGMA) supported this proposal as a Voting item and further stated that it strikes the appropriate compromise for regulators and consumers. He urged the group to maintain relevance by moving this issue forward. A state regulator commented that there should be a reference at the point of sale that indicates a mass reading such as pounds since the volume of gallons is not based on energy but only on weight. Instead of comparing energy content to energy content, this equivalency factor would only equate weight with weight. The industry representative indicated that whatever is on the price sign must be exactly what is on the pump. The industry representative also indicated that the industry would not have issue with having an equivalency statement on the pump. A state regulator commented that this proposal should move forward as a Voting item. A state regulator commented that tax officials in his state had a difficult time understanding the equivalency concepts and how to apply tax to those equivalencies. He believes the disparity between a diesel gallon equivalent and a gasoline gallon equivalent will be very problematic and confusing. The industry representative commented that while the diesel and gasoline gallon equivalents are different conversion factors today, he anticipates the conversion factor becoming a single equivalency rate in the near future. A state regulator commented that until a study is done to determine the economic impact of this proposal regarding assessing tax of the product per pound, the proposal should be Withdrawn. The state industry representative reminded the group that this body is contributing to consumer confusion and runs the risk of irrelevancy if the Conference does not move this proposal forward. A state regulator commented that politics has gotten interjected into a scientific discussion, but this is one of the rare occasions where elected politicians have come to the Conference and told regulators what they want and what they need, even though it may not be the best measurement method. Another state regulator commented that he disagreed with this statement, and suggested it is the role of the regulatory community to be the stopgap to advise policy makers of the best metrological provable and traceable units. Since there is no new information or data forthcoming, CWMA recommended that this item be a Voting item.

At the 2015 NEWMA Interim Meeting, no comments were heard on the item. NEWMA believes the item is fully developed and recommended that it be a Voting item.

At the 2015 SWMA Annual Meeting, these items were heard along with S&T Item 337-1. Dr. Matthew Curran (Florida) expressed concerns about the community not being able to get this issue addressed, for the industry and marketplace, and cited four general possible options for this item; adopt mass method of sale; adopt volume equivalent method of sale; adopt a dual/alternating display system; or withdraw it. Dr. Curran noted that the issue failed to pass

the last two years as members appear to be firmly entrenched in their mass or volume equivalent positions, so the first two options are not possible. He felt the item would find the same fate if we didn't think "outside of the box" and find a solution. He added that the fourth option (to withdraw the items) wasn't a preferred option since it would lead to individual state adoption or boutique markets. Dr. Curran felt the third option was worth exploring and provided suggested language for a dual/alternating display to use as a jumping off point, but challenged the community to get creative and come up with other ideas to move this item forward, if they felt this proposal wasn't acceptable. The language would not be effective until 2020, or another date decided by the membership, and it would be non-retroactive to prevent industry from having to replace existing devices. An industry member stated they were concerned over potential consumer confusion with a dual/alternating display option. Mr. Gordon Johnson (Gilbarco) replied that it would cost between $400,000 to $600,000 to redesign the face of the dispensers. Mr. Johnson was reminded that the toggle switch option had been suggested when this idea was first brought to the table two years ago. Mr. Johnson also added that all their resources were occupied with the credit card reader changes. He further stated that some of his customers require NTEP approval, but they can't get NTEP approved dispensers until this issue is resolved. Mr. Johnson did state he would take this idea back to discuss with his company. A representative from Wayne Fueling Systems agreed with Mr. Johnson's comments. Ms. Carol Hockert (NIST) added that they have witnessed testing occurring in the field based on the volume equivalent and not mass (as is read by the instrument). The SWMA submitted revisions to the following Sections 2.27.2. Method of Retail Sale, 2.27.2.2. Dispenser Labeling, and 2.27.2.3. Method of Retail Sale. The SWMA believes that it is fully developed and recommended that it be a Voting item.

2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel.

2.27.1. Definitions.

2.27.1.1. Compressed Natural Gas (CNG). – A gaseous fuel composed primarily of methane that is suitable for compression and dispensing into a fuel storage container(s) for use as an engine fuel.

~~**2.27.1.2. Gasoline Liter Equivalent (GLE).** – **Gasoline liter equivalent (GLE) means 0.678 kg of natural gas.**~~

2.27.1.2.~~3.~~ Gasoline Gallon Equivalent (GGE). – Gasoline gallon equivalent (GGE) means 2.567 kg (5.660 lb) of **compressed** natural gas.

2.27.1.3. Diesel Gallon Equivalent (DGE). – Diesel gallon equivalent means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.

2.27.1.4. Liquefied Natural Gas (LNG). – Natural gas which is predominantly methane that has been − 162 °C (− 260 °F) at 14.696 psia and stored in insulated cryogenic fuel storage tanks for use as an engine fuel.

2.27.2. Method of Retail Sale and Dispenser Labeling.

2.27.2.1. Method of Retail Sale. – All **compressed** natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline ~~**liter equivalent (GLE), or gasoline**~~ gallon equivalent (GGE), **diesel gallon equivalent (DGE) units and ~~or~~ mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls.**

(Non-retroactive as of January 1, 2020)

2.27.2.2. Dispenser Labeling Compressed Natural Gas. – All retail **compressed** natural gas dispensers shall be labeled with the **equivalent** conversion factor in terms of ~~**kilograms or**~~ pounds **(lb).** The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have ~~**either**~~ the statement "1 Gasoline Gallon Equivalent (GGE) ~~**is equal to**~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** ~~**consistent with the method of sale used.**~~

2.27.2.3. Method of Retail Sale. – All liquefied natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be measured in mass, and indicated in diesel l gallon equivalent (DGE) units, ~~and or~~ mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls.

(Non-retroactive as of January 1, 2020)

2.27.2.4. Dispenser Labeling of Retail Liquefied Natural Gas. – All retail liquefied natural gas dispensers shall be labeled with the equivalent conversion factor in terms of pounds (lb). The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas".

(Amended 20XX)

At the 2016 NEWMA Annual Meeting, Mr. Ethan Bogren (Chair of the WG) commented that new language is being proposed under S&T Item 337-2. There is one change to the current language in this item, found under printer requirements NIST Handbook 44, Section S.6.(b) that states anytime an equivalency value is used for method of sale, the corresponding quantity in mass must be listed on the receipt. An industry representative with fuel marketing and retail groups directed a question to the representative from Gilbarco – is what gets printed on the receipt a point of sale issue or a method of sale issue? The Gilbarco representative commented it was a point of sale issue. The fuel marketer representative asked if this was practically achievable in the equipment world. Mr. Bogren indicated that discussion during WG meetings seemed to indicate it was practical – only one line would be added to the receipt. The Gilbarco representative indicated that his company cannot currently convert an equivalency value into mass onto a receipt. This issue was discussed with other manufacturers, and it is feasible but does not currently exist. Another fuel marketer industry representative commented that the information from the dispenser to the point of sale is programmed to convey the sales transaction information. He further commented that under this new option, the conversion calculation would become the responsibility of the point of sale manufacturers to accurately capture that conversion. A retired regulator commented that there is no requirement for dual pump displays, so why this information? He added that a single conversion statement could be added as a line of text, but not the calculation itself. Mr. Bogren commented that without this change, the WG would be submitting the same item that has failed for the past three years. The representative from Wayne Fueling commented he thinks this provision is possible, but is not recommending it. A retired state weights and measures official commented that the sellers and the buyers don't care about this, and regulators should not be interfering. Mr. Bogren explained that altering the point of sale (POS) software is a relatively easy way to introduce something new for the Conference to consider. An industry representative from the fuel marketers commented that he is concerned that the POS companies should be consulted on this proposal. Mr. Bogren commented that there were POS industry attendees at the joint session who had an opportunity to comment on this proposal, and they did not object. The fuel marketer industry representative indicated that his members were trying to gather information from their vendors. The NIST Technical Advisor commented items that are designated as Voting are considered fully developed. If they are not technically fully developed, their status may need to be deescalated. NEWMA considers this item to be fully developed and ready as a Voting item.

At the 2016 CWMA Annual Meeting, there was considerable discussion; the Committee was split evenly as to whether the item should move forward with Voting status or be Withdrawn. During the voting session, a state regulator from Kansas indicated he wondered why we are essentially proposing selling one item as two items (GGE and DGE). A state regulator from Minnesota commented that the item was fully developed and should move forward as a Voting item. A state regulator from Missouri stated that the Central Region should differentiate between actual support of the item and recommending it move forward as a Voting item strictly because it is fully developed. A state regulator commented that the region's views be stated in the regional report, including the comment that the region was divided in its support of the item. An API representative commented that if the body does not pass this provision, each state will enact its own version of this law. A state regulator from Missouri indicated there may be some additional language that modifies the proposal during the Annual Meeting in July. Following a hand vote, the region determined the item should move forward as a Voting item with the proposed change: 2.27.1.4. Liquefied Natural Gas 14.696 psi should read 14.696 psia.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

232-9 I Section 2.XX. Automatic Transmission Fluid. (See Related Item 237-4)

Source:
American Petroleum Institute (2016)

Purpose:
Define how transmission fluids shall be identified in the marketplace on delivery documents, invoices, and receipts from service.

Item under Consideration:
Amend NIST Handbook 130, Uniform Regulation for the Method of Sale of Commodities as follows:

2.XX. Automatic Transmission Fluid.

2.XX.1. Labeling of Automatic Transmission Fluid. – Automatic transmission fluid shall be labeled.

2.XX.1. Labeling. – The label on a container of automatic transmission fluid, as well as the invoice or receipt from bulk distribution and service on an automatic transmission that includes the installation of automatic transmission fluid dispensed from a receptacle, dispenser, or storage tank shall not contain any information that is false or misleading.

(a) In addition, each packaged container shall be labeled with the following:

(1) the brand name;

(2) the name and place of business of the manufacturer, packer, seller, or distributor;

(3) the words "Automatic Transmission Fluid";

(4) the performance claim or claims for the fluid; and

(5) an accurate statement of the quantity of the contents in terms of liquid measure.

(b) Each receptacle and/or storage tank of automatic transmission fluid shall be labeled with the following:

(1) the brand name;

(2) the name and place of business of the manufacturer, packer, seller, or distributor;

(3) the performance claim or claims for the fluid; and

(4) the words "Automatic Transmission Fluid."

2.XX.2. Documentation of Claims Made Upon Product Label. – Any manufacturer, packer, or distributor of any product subject to this article and sold in this state shall provide, upon request of duly authorized representatives of the Director, documentation of any claim made upon their product label.

(Added 20XX)

Background/Discussion:
Many original equipment manufacturers (OEMs) set their own transmission fluid standards and recommend that consumers use these fluids in their designated applications. However, the current version of NIST Handbook 130 does not adequately define how transmission fluids shall be identified in the marketplace on delivery documents and

invoices and receipts from service. Requiring more specific information on invoices and receipts will provide some assurance to consumers that recommended automatic transmission fluids are being installed in their cars and trucks.

The changes proposed are consistent with those approved for gasoline and diesel engine (motor) oils sold in packages or dispensed from bulk containers.

At the 2016 NCWM Interim Meeting, Dr. Curran (FALS Chair) recommended that this (and related Item 237-4) be an Information item, so -the language can be worked on. Several members supported additional work on this proposal. The Committee recommends this as an Informational item.

At the 2016 NCWM Annual Meeting, Mr. Ferrick (API) submitted modified language to FALS and the Committee for consideration. The Committee moved forward this language and looks forward to receiving feedback from the Fall Regional Meetings.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Ferrick remarked that there is a need to revise the way automatic transmission fluids (ATF) are identified in the marketplace on delivery documents, invoices, and receipts from service. He stated that many original equipment manufacturers (OEMs) set their own transmission fluid standards and recommend that consumers use these fluids in their designated applications. In many cases, these standards are unique to the OEM's transmissions, and must be used to ensure proper operation. However, the current version of NIST Handbook 130 does not adequately define how transmission fluids are identified in the marketplace on delivery documents, invoices and receipts. Requiring more specific information on invoices and receipts will provide some assurance to consumers that recommended automatic transmission fluids are being installed in their cars and trucks. Proper identification will also assist state weights and measures officials in determining performance claims for transmission fluids sold in bulk in their states. Additionally, the changes proposed are consistent with those approved for gasoline and diesel engine (motor) oils sold in packages or dispensed from bulk. A regulator expressed concerns for the term and definition of "performance claim for fluid" since it would be challenging to enforce. He requested additional clarification at the NCWM with a possible amendment to add "performance claims" refers to additives, not ATF. WWMA forwarded the item to NCWM, recommending it as a Voting item with the following recommended editorial changes to renumber sections:

- 2.XX.1. to 2.XX.1.1. Labeling
- 2.XX.2. to 2.XX.1.2. Documentation of Claims Made Upon Product Label
- Remove the word "packaged" from the proposed language: ("In addition, each ~~**packaged**~~ container shall be labeled with the following") striking the word "packaged" is appropriate because a container is a package. Other sections in this regulation refer to a "container, receptacle, dispenser, storage tank." In no other place is a container described as a "packaged container."

At the 2015 CWMA Interim Meeting, an American Petroleum Institute (API) representative remarked that NIST Handbook 130 does not allow for proper identification of transmission fluids sold in states, and API supports adding new language for both the Method of Sale and Engine Fuels and Automotive Lubricants Regulations. He indicated the term "receptacle" might need to be changed in the proposal as well as performance claim language to performance specification instead. He explained that most OEMs engine manufacturers have their own transmission fluid standards, unlike motor oil. An industry representative from the Automotive Oil Change Association commented that one possibility could be a part number for transmission fluid labeling. Most OEMs will provide a preferred brand as well as at least one alternate option. Industry representatives recommended this proposal continue as a Developing item. A state regulator commented this is an important proposal and should move forward, but should have time to be fully vetted. CWMA believes that industry will continue to work on collaboration and education regarding this item and believes the item is sufficiently developed. CWMA forwarded the item to NCWM, recommending that it be a Voting item.

At the 2015 NEWMA Interim Meeting, a representative from the American Petroleum Institute (API) remarked that this item is intended to add some definition to transmission fluid so the consumer knows what they are getting, and it is properly labeled. A state regulator asked how the product is displayed or where it is stored at a retail oil change facility. He also asked if you have a service station with a permanent tank for transmission fluid, do they pour one type over another. The API representative said that different types of transmission fluids should not be commingled,

but common ATF's from different manufacturers can be commingled. Another state regulator asked for clarification on why item 3.14.(d), "duty type" was changed to "the performance claim or claims for the fluid?" Some who attended the CWMA Meeting commented that API made comments during that meeting in regards to the change, and API would provide further clarification at the 2016 NCWM Interim Meeting. NEWMA considered this item to be fully developed and forwarded it to NCWM, recommending it as a Voting item.

At the 2015 SWMA Annual Meeting, Mr. Ferrick stated that the proposed language has been shared with the WWMA, the CWMA, NEWMA, API's Lubricants Group, AOCA, and others. The WWMA raised some concerns about the term "performance claim" vs "duty cycle," and agreed there should be more suitable wording. API's plan is to provide an amended version in time for the NCWM 2016 Interim Meeting. It was noted that NIST provided some formatting edits and API recommends this version be submitted for inclusion into NCWM Publication 15. Dr. Curran (FALS Chair) stated that the FALS Committee would review the item and have comments for the 2016 NCWM Interim Meeting. The SWMA supported the item with the formatting changes recommended by NIST (also refer to Item 237-4) and more suitable language for the term "performance claim," which is expected to be addressed at the 2016 NCWM Interim Meeting. SWMA is recommending that this be a Voting item.

At the 2016 NEWMA Meeting, Mr. Ferrick stated this item should be an Informational item with new language coming in subsequent meetings. NEWMA awaits the new language and recommended that this item remain an Informational item.

At the 2016 CWMA Meeting, Mr. Ferrick commented the item should remain informational until additional details are compiled and presented to FALS

232-10 D Electric Watthour

Source:
NIST, OWM (2016)

Purpose:

1. Make the weights and measures community aware of work being done within the U.S. National Work Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for electric watthour meters used in submeter applications in residences and businesses.

2. Encourage participation in this work by interested regulatory officials, manufacturers, and users of electric submeters.

3. Allow an opportunity for the USNWG to provide regular updates to the S&T Committee and the weights and measures community on the progress of this work.

4. Allow the USWNG to vet specific proposals as input is needed.

Item Under Consideration:
Create a "Developing Item" for inclusion on the NCWM S&T Committee Agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) where progress of the USNWG can be reported as it develops legal metrology requirements for electric watthour meters and continues work to develop test procedures and test equipment standards. The following narrative is proposed for this item:

> In 2012, NIST, OWM formed the U.S. National Working Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for commercial electricity-measuring devices (including those used in sub-metering electricity at residential and business locations and those used to measure and sell electricity dispensed as a vehicle fuel) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).
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> In 2013, the NCWM adopted changes recommended by the USNWG to the NIST Handbook 130 requirements for the Method of Sale of Commodities to specify the method of sale for electric vehicle

refueling. At the 2015 NCWM Annual Meeting, the NCWM adopted NIST Handbook 44 Section 3.40. Electric Vehicle Refueling Systems developed by the USNWG.

This Developing item is included on the Committee's agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) to keep the weights and measures community apprised of USNWG current projects, including the following:

- The USNWG continues to develop recommended test procedures for inclusion in a new EPO 30 for Electric Vehicle Refueling Equipment along with proposed requirements for field test standards.

- The USWNG is continuing work to develop a proposed code for electricity-measuring devices used in sub-metering electricity at residential and business locations. This does not include metering systems under the jurisdiction of public utilities. The USNWG hopes to have a draft code for consideration by the community in the 2016-2107 NCWM cycle.

The USNWG will provide regular updates on the progress of this work and welcomes input from the community.

For additional information, contact USNWG Chair Ms. Tina Butcher at tbutcher@nist.gov or (301) 975-2196 or Technical Advisor, Ms. Juana Williams at Juana.williams@nist.gov or (301) 975-3989

237 NIST HANDBOOK 130 – UNIFORM ENGINE FUELS AND AUTOMOTIVE LUBRICANTS REGULATION

237-1 V Sections 1.36. Liquefied Natural Gas (LNG) and 3.11. Compressed Natural Gas (CNG)

(This item was Adopted.)

Source:
Clean Vehicle Education Foundation (2013)

Purpose:
Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item under Consideration: Amend NIST Handbook 130, Uniform Engine Fuels and Automotive Lubricants Regulation as follows:

Section 1. Definitions

1.36. Liquefied Natural Gas (LNG). – Natural gas that has been liquefied at − 162 °C (– ~~259~~**260** °F) and stored in insulated cryogenic tanks for use as an engine fuel.

(Amended 2016)

Section 3. Classification and Method of Sale of Petroleum Products

3.11. Compressed Natural Gas (CNG).

3.11.1. How Compressed Natural Gas is to be Identified. – For the purposes of this regulation, compressed natural gas shall be identified by the term "Compressed Natural Gas" or "CNG."

3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.

~~**3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) gasoline gallon equivalent (GGE).**~~

3.11.2.~~2~~1. Retail Dispenser Labeling.

3.11.2.~~2~~1.1. Identification of Product. – Each retail dispenser of CNG shall be labeled as "Compressed Natural Gas."

~~**3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statements "1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas "1 Gasoline Gallon Equivalent (GGE) is equal to 5.660 lb of Natural Gas consistent with the method of sale used.**~~

3.11.2.~~2~~1.~~3~~2. Pressure. – CNG is dispensed into vehicle fuel containers with working pressures of ~~**16 574 kPA,**~~ 20 684 kPa **(3000 psi),** or 24 821 kPa **(3600 psi)**. The dispenser shall be labeled ~~**16 574 kPa,**~~ 20 684 kPa **(3000 psi)**, or 24 821 kPa **(3600 psi)** corresponding to the pressure of the CNG dispensed by each fueling hose.

(Amended 2016)

3.11.2.~~2~~1.~~4~~3. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

3.11.3. Nozzle Requirements for CNG. – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

Background/Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a diesel liter equivalent (DLE) and a diesel gallon equivalent (DGE) will likely provide justification for California, Wisconson, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The mathematics justifying the specific quantity (mass) of compressed natural gas in a DLE and DGE (please refer to the "Report of the 99th National Conference on Weights and Measures" (SP1193, 2014).

At the 2014 NCWM Interim Meeting, Mr. Albuquerque (Chair, National Gas Steering Committee) notified the Committee that this item was actively being developed by the National Gas Steering Committee.

The L&R Committee is responded to the NGSC's June 10, 2014, request to change the NGSC's March 2014 recommendation for DGE units. The L&R Committee agreed that the CNG and LNG conversion factors proposed for use in converting these gases to DGE units should be revised in the 2014 Interim Report so that their numerical values are expressed to three decimal places rather than two decimal places. These changes are reflected in the following proposed modifications to Section 1. Definitions 1.XX., and to the proposed new definition for "diesel gallon equivalent" to read: 1 Diesel Gallon Equivalent (DGE) is ~~6.380~~ 6.384 pounds of Compressed Natural Gas and 1 Diesel Gallon Equivalent of Liquefied Natural Gas is ~~6.060~~ 6.059 pounds.

At the 2014 NCWM Annual Meeting, a joint session was held with L&R and S&T Committees to hear this item. It was noted that if the L&R Committee did not move Item 232-3 forward, there would be no reason to proceed with Item 237-2 and S&T Item 337-2 as it appeared in the "Report of the 98th National Conference on Weights and Measures." There was discussion regarding the term "approximately equal" in Sections 2.27.2.2. and 2.27.2.4. It was noted this term was not a measurement equivalency but equal to in energy content. It was recommended the Committee give consideration to amend the definition and clarify the meaning. Some spoke in opposition that this item would cause consumer confusion in the marketplace, if adopted. Several members questioned where IRS

obtained the numbers used on the IRS tax form. NIST provided an alternative proposal and several members believed this proposal should be taken into consideration. Since the proposal from the NGSC was not released until June 10, 2014, members felt they did not have enough time to vet the modification or the NIST proposal. The Committee reviewed numerous letters in support of all the items that reflect this issue.

March 2014 Natural Gas Steering Committee Report to the L&R and S&T Committees:
The Natural Gas Steering Committee (NGSC) was formed in July 2013 to help understand and educate the NCWM membership regarding the technical issues surrounding the proposed changes to NIST Handbooks 44 and 130 submitted by the Clean Vehicle Education Foundation (CVEF), the anticipated impact of the proposed changes, and issues related to implementation requirements when compressed natural gas (CNG) and liquefied natural gas (LNG) are dispensed and sold as a retail engine fuel in gallon equivalent units.

At the NCWM Interim Meeting, in January 2014, Mahesh Albuquerque, Chair of the NGSC provided the S&T and L&R Committees with an update from the NGSC, including proposed revisions to the proposals submitted by the CVEF. The NGSC heard comments from the floor related to the proposed revisions and requested additional time to further develop its recommendations. The S&T and L&R Committees agreed to allow the NGSC additional time to meet and develop alternative proposals to those on the S&T and L&R Committees January 2014 agendas, with the expectation that the NGSC recommendations would be ready for inclusion in NCWM Publication 16, and moved forward as a Voting item at the July 2014 NCWM Annual Meeting.

Summary of NGSC Meeting Discussions:
The NGSC met weekly following the January 2014 Interim Meeting and focused on modifying the Clean Vehicle Education Foundation (CVEF) 2013 proposals for the recognition of diesel gallon equivalent (DGE) units for CNG/LNG dispenser indications and the method of sale for these two natural gas alternative engine fuels. The NGSC reviewed multiple modifications to those proposals including:

- limiting sales to a single unit of mass measurement enforceable by 2016;
- requiring indications in mass and gasoline and diesel gallon equivalents, while phasing in mass only units;
- require sale by mass as the primary means, but allow for the simultaneous display of volume equivalent units, so long as the purchaser always had access to the mass (traceable) measurement; and
- a proposal from NIST, OWM which would allow the posting of supplemental information to assist consumers in making value comparisons and for use by taxation/other agencies, but requiring the phase in of indications in mass

The NGSC received:

- input from Department of Energy (DOE) on the latest edition of the DOE TRANSPORTATION ENERGY DATA BOOK: EDITION 32 July 2013 available on the Oak Ridge National Laboratory website at: **http://cta.ornl.gov/data/index.shtml**;
- updates from CNG (3) and LNG (1) dispenser manufacturers indicating their dispensing systems comply with the requirements in the handbooks and have the capability to indicate a sale in a single unit of measurement, and any further input on adding displays to the cabinet for additional units would require further cost analysis; while one orginal equipment manufacturer indicated use of their LNG RMFD in a fleet operation where indications are only in the DGE; and
- feedback from committee members related to the pros and cons of requiring the indication of sale in mass or gallon equivalent units, including traceability, equipment capabilities, marketplace considerations, and units used by state and federal agencies.

Also noted in the NGSC discussions were:

- how a gallon equivalent unit is derived using energy content, and that the gallon equivalent is defined and measured in terms of mass, not volume;

- for the last 20 years, NIST Handbook 44 and NIST Handbook 130 have required all dispensing equipment to indicate deliveries of natural gas in GGE units to consumers, and in mass units for inspection and testing purposes. CNG RMFD equipment in the most states comply with the requirements in the handbooks;
- international practices for indicating CNG and LNG engine fuel deliveries are predominantly mass; Canada requires LNG indications in the kilogram and the corresponding OIML R 139 "Compressed gaseous fuel measuring systems for vehicles" standard requires indication of the measured gas in mass;
- the variations in engine efficiency relative to a single conversion factor based on an averaged energy content for LNG and the primary focus of the driving public and fleets on mileage rather than petroleum products no longer used to fuel their vehicles;
- the work ahead over the next year by ASTM Committees to develop current CNG and LNG fuel quality standards which will need to be referenced in NIST Handbook 130;
- differences in the measurement of the gallon and kilogram – since the gallon is a volume measurement and not an energy measurement, and the NIST Handbook 44 Mass Flow Meters Code includes a requirement for volume-measuring devices with ATC used in natural gas applications to be equipped with an automatic means to make corrections, if the devices is affected by changes in the properties of the product; it was also noted that U.S. gasoline and diesel dispensers are not required to have ATC; whereas ATC does occur in sales at the wholesale level;
- how traceability applies to the measurement results at each level of the custody chain (to include the determination of the uncertainty of all calibrations and use of an appropriate unit of measurement); and
- the capabilities of equipment in the marketplace.

A DOE representative supported the use of gallon equivalents, and pointed out that they are used in the DOE Transportation Energy Data Book. The DOE representative also pointed out other federal agencies including the IRS were requiring use of gallon equivalent units for reporting.

Industry representatives on the NGSC indicated they are actively campaigning to their state and federal offices, encouraging each government branch to recognize sales of CNG and LNG in gasoline and diesel volume equivalent units. Industry sectors represented on the NGSC indicated that their customers are satisfied with the averaged fuel energy values that correspond to the conversion factors for CNG and LNG, with only one exception. The exception was a truck stop chain indicating their customers would be amenable to a single conversion factor for both fuels. The CVEF also provided a comparison of GTI's 1992 study results and preliminary data from a 2013 study. The CVEF reported the constituents in natural gas as basically unchanged over 21 years since the NCWM first recognized the GGE. Industry unanimously opposed a recommendation for phasing in mass as the only unit of measurement, noting also that U.S. drivers would be confused by SI units while acknowledging the United States is in the minority of countries whereby delivery and sales are by equivalent units. At the conclusion of the NGSC deliberations, NGVAmerica provided the following statement:

> One of the major advantages of the proposal as currently drafted with inclusion of the DGE and GGE units for natural gas is that this is a proposal that the natural gas industry can support. It further recognizes what is already the preferred practice for how natural gas is measured and dispensed. The latest proposal with DGE and GGE units provides a pathway forward toward a national consensus approach. If the proposal were to instead require use of kilograms or even pounds as the primary method of sale, industry would not support that proposal and likely would strongly oppose it this summer if NCWM were to consider it as a voting issue. Also, if NCWM finalizes on a standard that does not include DGE or GGE, industry is committed to pursuing adoption of an alternative standard on a state by state basis, which could lead to different treatment across the country. Several states have already introduced legislation to recognize the DGE standard (CA, IL, MO, and VA) and I expect more will do so later this year. And you know Colorado and Arkansas already have put in place standards that recognize the DGE units.

NGSC Recommendations:

After consideration of all of the above, the NGSC recommends alternate proposals to the L&R and S&T Committee's agenda items that further modify and consolidate the Clean Vehicle Education Foundation 2013 proposals to include:

1. requirements for measurement in mass and indication in gallon equivalent units (NIST Handbook 44, Paragraphs S.1.3.1.1. and S.1.3.1.2.; and NIST Handbook 130, Paragraphs 3.11.2.1. and 3.12.2.1.);
2. posting of a label that has both the GGE and DGE or the GLE and DLE for CNG applications NIST (Handbook 44, Paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2; and NIST Handbook 130, Paragraphs 3.11.2.2.2. and 3.12.2.2.2.);
3. expression of all equivalent conversion factors expressed in mass units to 3 significant places beyond the decimal point for consistency (NIST Handbook 44, Paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2. and Appendix D and NIST Handbook 130, Section 1, Paragraphs 3.11.2.2.2. and 3.12.2.2.2.);
4. correction of the temperatures in the LNG definition (NIST Handbook 130, Section 1);
5. addition of 16 CFR Part 309 for CNG automotive fuel rating (NIST Handbook 130, Paragraph 3.11.2.2.5.); and
6. reference to NFPA 52 (NIST Handbook 130, Paragraph 3.12.2.2.4.)

With regards to NIST Handbook 44 the NGSC recommends withdrawing S&T agenda Items 337-1 and 337-4 and the consolidation of agenda Items 337-2, 337-3, and 337-5 into a newly revised single Voting item designated as Item 337-2 as it appeared in the "Report of the 98th National Conference on Weights and Measures." The NGSC also recommends further modifications to corresponding NIST Handbook 130 prosposals to align the definitions of related terms and method of sale with definitions, indicated delivery and dispenser labeling requirements being proposed for NIST Handbook 44.

With regards to NIST Handbook 44, the NGSC also recommends consideration of new a Developing item addressing proposed changes to paragraph S.3.6 Automatic Density Correction designated as Item 360-4. This new proposal is consistent with the NGSC decision to encourage further work beyond the current scope of their work on the CVEF's proposals to fully address all LNG applications.

Representatives of the NGSC and the S&T and L&R Committees met in March 2014, all agreed on the course of action outlined above.

Additional Contacts: Clean Energy, Seal Beach, California, NGVAmerica, Washington, D.C., Clean Vehicle Education Foundation, Acworth, Georgia. Regional Association Comments: (Fall 2013 Input on the Committee's 2014 Interim Agenda Items 337-1 through 337-5)

With regards to NIST Handbook 130, the NGSC recommends withdrawing L&R Agenda Items 237-1 and the consolidation of agenda Items 237-2, 237-3, and 237-5 into newly revised single Voting item designated as 237-1 in the "Report of the 98th National Conference on Weights and Measures."

At the 2015 NCWM Interim Meeting, a joint session was held with the L&R and S&T Committees to discuss this Item 232-4 of the L&R report. Documentation for the S&T Item 337-1 can be found within the S&T report. Two proposals were addressed. Proposal One, titled "the Volume Equivalent Compromise" requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. The second proposal titled, "The Mass Compromise" would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison.

Proposal One was supported by industry representatives and several weights and measures officials. Some reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacturer dispensers that can indicate in both mass and equivalent gallons.

The second proposal was supported by numerous weights and measures officials who favor a traceable unit. Equivalent values are not NIST traceable units of measurement. The equipment currently can indicate in mass units. Currently, there are several products that allow for supplemental information to be posted (e.g., paint and fertilizer.) Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter because it may affect future proposals bought before

the Conference. The NIST Technical Advisor requested that the FALS review the references and data that are used for the values on the equivalent units. The FALS has agreed to put together a work group and provide addition feedback on this area. After solicitation for volunteers a mixed work group comprised of FALS and NGSC members was formed and is currently functioning under the NGSC. However, should the NGSC dissolve prior to completion of this review, the work group would move under FALS.

Mr. Ethan Bogren, NGSC Chair, provided the following write up from their NGSC's meeting on January 14, 2015.

Natural Gas Steering Committee Update Report – January 14, 2015:
The NGSC has been working diligently at achieving a compromise proposal regarding the sale of CNG/LNG as an alternative motor fuel. While the group has found success in establishing a consensus opinion in many aspects of the regulations, the group remains divided as to what unit of measure should be used for primary method of sale.

As you all know, there has been a proposal submitted urging NCWM to adopt gallon equivalent units (GGE/DGE) as the primary method of sale for natural gas products to be used as an alternative motor fuel. There has been a feeling by many members of NCWM that this would be considered a diversion from the customary units in which commodities are sold in the United States causing concern.

Since a consensus regarding the units used for the primary method of sale for natural gas products was unable to be achieved the NGSC is prepared to submit two proposals to the L&R and S&T Committees for comment and review. It was agreed by NGSC members that this was the only fair way to represent the whole group.

While both proposals have many similarities, I would like to summarize the major differences regarding the method of sale as it pertains to each document.

Volume Equivalent Compromise Version: CNG/LNG shall be measured in mass and indicated in gallon equivalent units unless the weights and measures official having jurisdiction mandates otherwise through local regulation. This would make GGE/DGE units the only unit of quantity required to be displayed on the dispenser during a retail transaction.

Mass Compromise Version: CNG/LNG shall be measured in mass and indicated in mass. The display of supplemental information would also be permitted on the dispenser. This would allow GGE/DGE units to be indicated on the dispenser display face as long as it is stated the GGE/DGE units are for value comparison purposes only.

There is a willingness to accept equivalent units for advertising purposes such as street signs.

The NGSC is confident that a compromise will be found with the guidance of the S&T and L&R Committees. Along with input coming from the floor during open hearings at the NCWM Interim Meeting, a sense of which proposal best represents the body of the National Conference of Weights and Measures may be determined.

At the 2015 NCWM Interim Meeting, a joint session was held with the L&R and S&T Committees to hear this item along with Item 232-4 of the L&R report. Documentation for the S&T Item 337-1 can be found within the S&T report. Proposal One, titled "The Volume Equivalent Compromise" requires natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal One was supported by industry representatives and several weights and measures officials. Reasons for supporting Proposal One is it will cause less consumer confusion. Having one method of sale that consumers are currently familiar with allows them to make value comparisons at the pump and quickly compare street signage with various stations. It would be costly to manufacturer dispensers that can indicate in both mass and equivalent gallons.

Proposal Two titled, "The Mass Compromise" would require natural gas to be measured and indicated in mass with supplemental equivalent information to be displayed on the dispenser for value comparison. Proposal Two was supported by numerous weights and measures officials who favor a traceable unit. Equivalent values are not NIST traceable units of measurement. The equipment is currently able to indicate in mass units. Currently there are several products that allow for supplemental information to be posted (e.g., paint and fertilizer.) Natural gas composition fluctuates and the equivalent values have not been validated. With new fuels being developed, the correct decision needs to be made on this matter because it may affect future proposals bought before the Conference. A NIST S&T

Technical Advisor requested that the FALS review the references and data that are used for the values on the equivalent units. The FALS has agreed to put together a work group and provide addition feedback on this area.

Proposal Two, "The Mass Compromise" recommended the following:

1.XX. Diesel Gallon Equivalent (DGE). – Diesel Gallon Equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas.

1.25. Gasoline Gallon Equivalent (GGE). – **Gasoline Gallon** Equivalent **(GGE) means ~~to 2.567 kg~~** (5.660 lb**)** of **compressed** natural gas.

~~1.26. Gasoline Liter Equivalent (GLE). Equivalent to 0.678 kg (1.495 lb) of natural gas.~~

1.35. Liquefied Natural Gas (LNG). – Natural gas that has been liquefied at – **~~126.1~~ 162** °C (– **~~259~~** °F) and stored in insulated cryogenic tanks for use as an engine fuel.

3.11. Compressed Natural Gas (CNG).

3.11.1. How Compressed Natural Gas is to be Identified. – For the purposes of this regulation, compressed natural gas shall be identified by the term "Compressed Natural Gas" or "CNG."

3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.

3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be **either** in terms of the gasoline **~~liter equivalent (GLE) or gasoline~~** gallon equivalent (GGE), **the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.**

3.11.2.2. Retail Dispenser Labeling.

3.11.2.2.1. Identification of Product. – Each retail dispenser of CNG shall be labeled as "Compressed Natural Gas."

3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the conversion factor in terms of **~~kilograms or~~** pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement **~~"1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas" or~~** "1 Gasoline Gallon Equivalent (GGE) **~~is equal to~~ means** 5.660 lb of **Compressed** Natural Gas**", or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas",** consistent with the method of sale used.

3.11.2.2.3. Pressure. – CNG is dispensed into vehicle fuel containers with working pressures of **~~16 574 kPa,~~** 20 684 kPa **(3,000 psig)**, or 24 821 kPa **(3,600 psig)**. The dispenser shall be labeled **~~16 574 kPa,~~** 20 684 kPa **(3,000 psig)**, or 24 821 kPa **(3,600 psig)** corresponding to the pressure of the CNG dispensed by each fueling hose.

3.11.2.2.4. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

3.11.3. Nozzle Requirements for CNG. – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

3.12. Liquefied Natural Gas (LNG).

3.12.1. How Liquefied Natural Gas is to be Identified. – For the purposes of this regulation, liquefied natural gas shall be identified by the term "Liquefied Natural Gas" or "LNG."

3.12.2. Retail Sales of Liquefied Natural Gas Sold as a Vehicle Fuel.

3.12.2.1. Method of Retail Sale. – All LNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.

3.12.~~2~~3. ~~Labeling of~~ Retail Dispensers ~~of Liquefied Natural Gas Sold as a Vehicle Fuel~~ Labeling.

3.12.~~2~~3.1. Identification of Product. – Each retail dispenser of LNG shall be labeled as "Liquefied Natural Gas."

3.12.3.2. Conversion Factor. – All retail LNG dispensers shall be labeled with the conversion factor in terms of pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas".

3.12.~~2~~3.~~2~~3. Automotive Fuel Rating. – LNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

3.12.~~2~~3.~~3~~4. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA ~~57~~52.)

Based upon information from the NGSC and information in Proposal One "Volume Equivalent Compromise Version" the Committee removed the following language that appeared in NCWM Publication 15 (2015) from the Item for Consideration:

Section 1. Definitions

1.XX. Diesel Gallon Equivalent (DGE). – means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas.

1.XX. Diesel Liter Equivalent (DLE). – means 0.765 kg of compressed natural gas or 0.726 kg of liquefied natural gas.

1.26. Gasoline Gallon Equivalent (GGE). – **means** 2.567 kg (5.660 lb) of **compressed** natural gas.

1.27. Gasoline Liter Equivalent (GLE). – **means** 0.678 kg (1.495 lb) of **compressed** natural gas.

Based upon information from the NGSC the Committee deleted Section 3.11.2.1. Method of Retail Sale and Section 3.11.2.2.2. Conversion Factor, and the entire Section for 3.12. Liquefied Natural Gas (LNG) from the Item Under Consideration in the 2015 NCWM Interim Report. The Committee is recommending it move forward as a Voting item.

Section 3. Classification and Method of Sale of Petroleum Products

3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be **measured** in terms of **mass, and indicated in** the gasoline liter equivalent (GLE)**,** gasoline gallon equivalent (GGE)**, diesel liter equivalent (DLE), or diesel gallon equivalent (DGE) units**.

3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the **equivalent** conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statements "1 Gasoline Liter Equivalent (GLE) is **Approximately Equal** to 0.678 kg of Natural Gas" **and "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas"** or **the statements** "1 Gasoline Gallon Equivalent (GGE) is **Approximately E**qual to 5.660 lb of **Compressed** Natural **Gas" and "1 Diesel**

Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas" consistent with the method of sale used.

3.11.2.2.5. Automotive Fuel Rating. – CNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 309.

At the 2015 NCWM Annual Meeting, a joint session was held with the L&R and S&T Committees to hear this item along with Item 232-4 and S&T Item 337-1. (Documentation for the S&T Item 337-1 can be found within the S&T report.) The Committee acknowledged receiving letters in support of these items and the majority of comments made during the open hearings were also in support of this proposal. It was noted that measurement principles, value comparisons, traceability (note: equivalents are not traceable) need to be analyzed. It is difficult to work with equivalent values that fluctuate in value. There is a task group under the FALS that is currently looking at the equivalent numbers. A corrected document was received for Appendix A., Background and Justification for NIST Handbook 130, Definition of "Diesel Gallon Equivalent (DGE)" of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel.

A majority of the Committee believes the changes submitted during open hearings are fully developed and will align with language proposed in S&T Item 337-1. The language changes support clarifying that two types of natural gas exist as a motor vehicle fuel [compressed and liquefied]. Additionally, the proposal makes it clear that the method of sale for compressed natural gas may be either GGE, DGE, or mass, and for liquefied natural gas the method of sale may be DGE or mass; however, all natural gas sold as a vehicle fuel shall be measured in mass. This item along with Item 232-4 and S&T Committee Item 337-1 received a split vote, therefore it was returned to the Committee.

At the 2016 NCWM Interim Meeting, Dr. Curran (Florida and FALS Chair) remarked that this is separate than Item 232-8 and he supports this item and recommends it as a Voting item. Ross Andersen (retired state director) remarked that he questions significant figures on the PSI versus pascals, there is too much precision. A NIST Technical Advisor remarked that they were informed that the information focus group sent out information on January 8, 2016, and there may be changes to the equivalency factors. Dr. Curran remarked that the focus group has no recommendation for changes. The Committee was concern that changes to values may occur at the NCWM Annual Meeting. If this does occur, they would like validation of any figures not currently in the publication. The Committee is recommending this as a Voting item.

At the 2016 NCWM Annual Meeting, a joint Open Hearing session was held with S&T Committee to hear testimony on all the LNG/CNG agenda items. Mr. Jeff Clarke remarked that the Conference should adopt a uniform standard that is used by all states. Mr. Randy Moses suggest changing the language to have the conversion at the end of the receipt in mass. NIST/OWM submitted a technical analysis to the Committee that expresses that a method of sale should provide uniformity, transparency, and accuracy. Ms. Butcher also discussed weights and measures principles, limited supporting data, supplemental information, among many other factors to be reviewed. Dr. Curran (FALS Chair) remarked that there is a CNG/LNG Equivalent Values informal focus group, but they do not have an official position. Some states expressed support for this item and remarked this is what their customers are supporting. Several states remarked that they currently have legislative law. Some commented that this needs to align with the current tax regulation. Again, the topic of the dual display was discussed; however, would this cause consumer confusion?

Regional Association Comments:
At the 2015 WWMA Annual Meeting, support was heard from seven regulators that this be a Voting item. One regulator objected to the fact that it violates weights and measures principles and referred to the NIST, OWM Technical Analysis document, against the use of equivalent units for natural gas. Another regulator would like a grandfather period of ten years and then a conversion to mass units on dispensers and advertising. WWMA believes this item is fully developed with the recommended amendment as noted above, which emphasizes that the dispenser labeling is only needed when the equivalent units are used (not necessary when indications are in mass). WWMA recommended that this item be a Voting item.

At the 2015 CWMA Interim Meeting, an industry representative from National Association of Convenience Stores (NACS), National Association of Truck Stop Operators (NATSO), Petroleum Marketers Association of America (PMAA) and Society of Independent Gasoline Marketers of America (SIGMA) supported this proposal as a Voting item and further stated that it strikes the appropriate compromise for regulators and consumers. He urged the group

to maintain relevance by moving this issue forward. A state regulator commented that there should be a reference at the point of sale that indicates a mass reading such as pounds since the volume of gallons is not based on energy but only on weight. Instead of comparing energy content to energy content, this equivalency factor would only equate weight with weight. The industry representative indicated that whatever is on the price sign must be exactly what is on the pump. The industry representative also indicated that the industry would not have issue with having an equivalency statement on the pump. A state regulator recommended that this proposal move forward as a Voting item. A state regulator commented that tax officials in his state had a difficult time understanding the equivalency concepts and how to apply tax to those equivalencies. He believes the disparity between a diesel gallon equivalent and a gasoline gallon equivalent will be very problematic and confusing. The industry representative commented that while the diesel and gasoline gallon equivalents are different conversion factors today, he anticipates the conversion factor becoming a single equivalency rate in the near future. A state regulator commented that until a study is done to determine the economic impact of this proposal regarding assessing tax of the product per pound, the proposal should be Withdrawn. A state industry representative reminded the group that this body is contributing to consumer confusion and runs the risk of irrelevancy if the Conference does not move this proposal forward. A state regulator commented that politics has gotten interjected into a scientific discussion, but this is one of the rare occasions where elected politicians have come to the Conference and told regulators what they want and what they need, even though it may not be the best measurement method. Another state regulator commented that he disagreed with this statement, and suggested it is the role of the regulatory community to be the stopgap to advise policy makers of the best metrological provable and traceable units. Since there is no new information or data forthcoming, CWMA recommended that this be a Voting item.

At the 2015 NEWMA Interim Meeting, there were no comments heard. NEWMA believes this item is fully developed and recommends this be a Voting item.

At the 2015 SWMA Annual Meeting, Dr. Curran recommended that this item be a stand-alone item and not be batched with the other LNG items on the agenda. The SWMA recommended it be a Voting item.

At the 2016 NEWMA Annual Meeting, Mr. Ethan Bogren (Chair of the WG) commented that new language is being proposed under S&T Item 337-2. There is one change to the current language in this item, found under printer requirements NIST Handbook 44, Section S.6.(b) that states anytime an equivalency value is used for method of sale, the corresponding quantity in mass must be listed on the receipt. An industry representative with fuel marketing and retail groups directed a question to the representative from Gilbarco – is what gets printed on the receipt a point of sale issue or a method of sale issue? The Gilbarco representative commented it was a point of sale issue. The fuel marketer representative asked if this was practically achievable in the equipment world. Mr. Bogren indicated that discussion during WG meetings seemed to indicate it was practical – only one line would be added to the receipt. The Gilbarco representative indicated that his company cannot currently convert an equivalency value into mass onto a receipt. This issue was discussed with other manufacturers, and it is feasible but does not currently exist. Another fuel marketer industry representative commented that the information from the dispenser to the point of sale is programmed to convey on the sales transaction information. He further commented that under this new option, the conversion calculation, would then become the responsibility of the point of sale manufacturers to accurately capture that conversion. A retired regulator commented that there is no requirement for dual pump displays, so why this information? He added that a single conversion statement could be added as a line of text, but not the calculation itself. Mr. Bogren commented that without this change, the WG would be submitting the same item that has failed for the past three years. The representative from Wayne Fueling commented he thinks this provision is possible, but is not recommending it. A retired state weights and measures official commented that the sellers and the buyers don't care about this, and regulators should not be interfering. Mr. Bogren explained that altering the point of sale (POS) software is a relatively easy way to introduce something new for the Conference body to consider. An industry representative from the fuel marketers commented that he is concerned that the POS companies should be consulted on this proposal. Mr. Bogren commented that there were POS industry attendees at the joint session who had an opportunity to comment on this proposal, and they did not object. The fuel marketer industry representative indicated that his members were trying to gather information from their vendors. The NIST Technical Advisor commented that items that are designated as Voting are considered fully developed. If they are not technically fully developed, their status may need to be deescalated. NEWMA considers this item to be fully developed and ready as a Voting item.

At the 2016 CWMA Annual Meeting, there was considerable discussion, the Committee was split evenly as to whether the item should move forward as with Voting status or be Withdrawn. During the voting session, a state regulator

from Kansas indicated he wondered why we are essentially proposing selling one item as two items (GGE and DGE). A state regulator from Minnesota commented that the item was fully developed and should move forward as a Voting item. A state regulator from Missouri stated that the Central Region should differentiate between actual support of the item and recommending it move forward as a Voting item strictly because it is fully developed. A state regulator commented that the region's views be stated in the regional report, including the comment that the region was divided in its support of the item. An API representative commented that if the body does not pass this provision, each state will enact its own version of this law. A state regulator from Missouri indicated there may be some additional language that modifies the proposal during the Annual Meeting in July. Following a hand vote, the region determined the item should move forward as a Voting item with the proposed change: Paragraph 2.27.1.4. – correction 14.696 psi should read 14.696 psia.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

237-2 V Section 2.1.2. Gasoline-Ethanol Blends

(This item was Adopted.)

Source:
American Petroleum Institute (2016)

Purpose:
Extend the effective date of the 1 psi vapor pressure exception to May 1, 2017, and make the effective date for this change July 28, 2016.

Item under Consideration:
Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

2.1.2. Gasoline-Ethanol Blends. – When gasoline is blended with ethanol, the ethanol shall meet the latest version of ASTM D4806, "Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel," and the blend shall meet the latest version of ASTM D4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," with the following permissible exceptions:

(a) The maximum vapor pressure shall not exceed the ASTM D4814 limits by more than:

(1) 1.0 psi for blends containing 9 to 10 volume percent ethanol from June 1 through September 15.

(2) 1.0 psi for blends containing one or more volume percent ethanol for volatility classes A, B, C, D from September 16 through May 31.

(3) 0.5 psi for blends containing one or more volume percent ethanol for volatility Class E from September 16 through May 31.

The vapor pressure exceptions in subsections 2.1.2. Gasoline-Ethanol Blends will remain in effect until May 1, ~~**2016**~~ **2017**, or until ASTM incorporates changes to the vapor pressure maximums for ethanol blends, whichever occurs earlier.
(Effective July 28, 2016)
(Amended 2016)

NOTE 1: *The temperature values (e.g., 54 °C, 50. °C, 41.5 °C) are presented in the format prescribed in ASTM E29 "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications."*

(Added 2009) (Amended 2012 **and 2016**)

Background/Discussion:
The exception to the ASTM standard that allowed a 1.0 psi vapor pressure waiver for ethanol blended gasoline (0.5 psi for Class E modified at that time) was allowed to remain in the NIST Handbook 130 until May 1, 2016, or upon completion of the ASTM work to incorporate the "vapor pressure exception" into D4814, whichever occurs first.

However, as explained below, if the issue is not resolved at ASTM prior to the effective date of May 1, 2016, additional time will be needed to pursue the change to the ASTM specification. It is for this reason that API, supported by National Association of Convenience Stores (NACS), National Association of Truck Stop Operators (NATSO), Petroleum Marketers Association of America (PMAA) and Society of Independent Gasoline Marketers of America (SIGMA), is pursuing this one-year extension to the original effective date.

To generate data in support of a ballot at ASTM for the vapor pressure exception, significant research by the Coordinating Research Council (CRC) has been completed, which shows that the drivability of the vehicle is not negatively impacted by the vapor pressure exception (CRC Report No. 668). It is important to note that significant resources were expended to complete this research in an expedient manner so that the research results would be available to the ASTM members. Using the CRC research as background, this year (2015) ASTM conducted a Subcommittee A ballot for the vapor pressure exception that closed with one negative vote which has since been resolved. The document is currently being balloted by the main ASTM Committee on fuels and the ballot closed September 17.

The ASTM ballot to incorporate the 1-psi vapor pressure exception into D4814 is scientifically and technically sound. However, there is a possibility that the ballot could be held up from further consideration or even defeated at the Main Committee at this time because of ongoing issues with separate ballots that propose to incorporate 15-volume percent ethanol blends (E15) into D4814. If the RVP ballot does not pass at ASTM, then the vapor pressure exception that is currently available in NIST Handbook 130, "Uniform Engine Fuels and Automotive Lubricants Regulation," will expire, removing the exception from many states, largely on the Midwest and East Coast.

The vapor pressure exception is critical to the fungibility of the U.S. gasoline supply during the winter months of September 16 to May 31. The map (**www.ncwm.net/meetings/interim/archive**), 12 states have adopted the vapor pressure exception provided by NIST Handbook 130 including: Maine, New Jersey, Pennsylvania, Virginia, West Virginia, Tennessee, Texas, Arkansas, Missouri, Illinois, Iowa, and Washington. If the ASTM ballot does not pass the D02 Committee, the states that are served by the Colonial Pipeline and Buckeye Pipeline could also be impacted as they may not have the tank storage necessary to manage the additional products that would be needed in those states that would continue to grant the exception and those that would eliminate the vapor pressure exception. Consequently, the 13 states that would be impacted on May 1, 2016, would be expanded to include an additional 10 states served by Colonial (Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, and Maryland) and by Buckeye (Kentucky, Ohio, and Indiana) and the District of Columbia. This impact could possibly create fuel shortages in these states putting upwards pressure on the gasoline markets.

When this issue was being debated in 2012, several pipeline companies identified issues with the proposal relating to supply and hose issues are still applicable today. Refer to Magellan's and Colonial's letters to the FALS that identify the concerns with the loss of the vapor pressure exception:[1]

> [Magellan is] opposed to the elimination of the [vapor pressure exception] because it would (1) create a boutique fuel in several states (2) reduce pipeline efficiency which would result in supply disruptions (3) reduce gasoline supply by requiring a reduction of RVP and (4) impact the price unsuspecting motorists pay at the pump." [January 19, 2012]
>
> It is Colonial's understanding that all states along our system grant a 1.0 psi waiver for Non-VOC controlled RVP with the exception of Virginia, which adopts the latest version of HB 130. If this

[1] **http://www.nist.gov/pml/wmd/pubs/upload/07-lr-appx-d-237-1-12-annual-final.docx**

> proposal were to go into effect, it would create a unique fuel to the State of Virginia markets. [January 20, 2012]

All efforts are being made to ensure that the vapor pressure exception will be implemented in ASTM D4814 in a timely manner so that the U.S. fuel supply will not be negatively influenced.

The proposal to make the one-year extension effective July 28, 2016, will ensure that the vapor pressure exception continues to be available starting September 16, 2016. If the date is effective on January 1 of the following year (2017) then this would translate into a loss of the 1.0 psi (and 0.5 psi) waiver from September 16, 2016, to December 31, 2016, with the resulting consequences identified above.

NIST Handbook 130 (2015) Introductions allows for the effective date to be something other than January 1 of the year following adoption. Specifically, Section R of the Introduction, page 6, states, "**Unless otherwise specified,** the new or amended regulations listed in this section are intended to become effective and subject to enforcement on January 1 of the year following adoption by NCWM." [Emphasis added]. The language, "**unless otherwise specified**" allows the NCWM to set the effective date for changes subject to enforcement to any date in the calendar year. The July 28, 2016, date was chosen as it is hoped that this proposal will be adopted by the Conference on the last day of the 2016 Annual NCWM Conference and would then be implemented immediately, which would allow certainty in the market place and assist in limiting supply disruptions that might be seen by the consumer.

During the original debate, there was a strong sentiment from a few states that the date should not be extended. Statements at the time supported the argument that ASTM was the proper venue to grant a waiver and that work should be done to ensure that the consumer's engine would operate properly in the heat and cold (i.e., drivability was not impacted). Since that time, a very significant research project (> $1MM) was conducted by the CRC that found that drivability was NOT negatively impacted. Drivability is effectively the ability of the vehicle's ease of start (whether engine is cold or hot), warm up performance, and smooth responsive acceleration.

EPA grants a 1.0 psi RVP exception for non-RFG areas during the summer months (June 1 through September 15). For example, during the summer months, gasoline sold in an area with a 9.0 RVP gasoline specification when blended with 10 % volume ethanol can have a 10.0 RVP. The NCWM has granted a 1.0 psi RVP exception during the non-summer months and has not had any significant or meaningful impact to the consumer's drivability.

The vapor pressure exception is critical to the fungibility of the U.S. gasoline supply during the winter months of September 16 to May 31. Without the 1.0 psi (0.5 psi) RVP exception, there is a possibility of reducing supply in nearly all the states from Iowa to Pennsylvania down to Georgia and back to Texas putting upwards pressure on gasoline markets in those states.

At the 2016 NCWM Interim Meeting, Mr. Prentiss Searles (API) provided a presentation. The NIST Technical Advisor remarked that the term "unless otherwise specified" is intended for effective dates that were after the January adoption date. There is concern that this would set a precedent in allowing other items to have early adoption dates. It was understood that this is a unique request and it was encouraged that API not request another extension, and that this be resolved through ASTM. Mr. Searles stressed that if this extension did not proceed it would disrupt the fuel supply and have significant impact on the marketplace. Several states remarked that they had alternative ways to handle the exception through their states. The Committee agreed to recommend this as a Voting item.

At the 2016 NCWM Annual Meeting, Dr. Curran (FALS Chair) commented that FALS does support this item. Several states spoke in support of this item

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Prentiss Searles (API) gave a brief presentation. The proposal includes a request to extend the date of the 1-psi waiver pending the development of the issue at ASTM. ASTM must adjudicate the comments that have been received. The Committee received a letter of support from Tim Columbus (Steptoe & Johnson, LLP), representing four trade associations (NACS, NATSO, PMAA and SIGMA). A regulator supports but recognizes this is an east coast issue and this proposal's exceptions in 2.1.2.(a)(2) do conflict with one state's existing statute. An industry representative expressed support for this item and stated that ASTM's vote would harmonize

with NIST Handbook 130 and encouraged NCWM members who are also ASTM members to vote in favor of the ASTM item. WWMA forwarded the item to NCWM, recommending is as a Voting item.

At the 2015 CWMA Interim Meeting, Mr. Chuck Corr (ADM) representative member of the FALS work group to update Engine Fuels and Automotive Lubricants Regulations remarked that based on the language of NIST Handbook 130, gasoline ethanol blends would receive the waiver, but not all fuels today are gasoline blends. He believes this item should be developed further. A state regulator commented that this proposal is hanging on to an advantage that gasoline has had over ethanol. If this waiver were removed, it would force industry to make a blendstock that could be blended to E15. She believes we should not extend the waiver. If consumers want to purchase E15, they should be allowed to do so. To extend the waiver would continue to provide an advantage in the marketplace. The regulator suggested a better alternative would be to extend the waiver to E15. A consultant for the Illinois Corn Growers commented that the original goal in the change of NIST Handbook 130 was to take away exceptions to the performance specification developed at ASTM. The regulator further commented that the full ASTM D02 Committee is balloting this item, and there were seven negative votes. The regulator believes the item should remain as a developmental item and should be referred to FALS. A state regulator agreed there is a need to push this issue back to ASTM to get these parameters included in the standard. He recommended the item be Withdrawn. A state regulator commented there are deeper implications to this proposal than some might realize. The regulator commented that the definitions are a critical component of this issue. The sunset date listed in NIST Handbook 130 is May 2016, and the handbook is published in the fall of every year. So, if the date is not changed, the waiver will sunset. This issue is a fuels issue and should be considered and deliberated with the expertise of the FALS. CWMA forwarded the item to NCWM and recommended it be an Informational item assigned to FALS.

At the 2015 NEWMA Interim Meeting, they received written comments from an industry representative suggesting that this item be referred to FALS. One regulator asked how this would impact his state if the waiver expires. There was concern that the sunset date will occur before a vote may occur on this item. A retired regulator suggested this item move forward because the sunset date will expire prior to when NCWM can extend it. Another state regulator also commented that a state sealer has some leeway in local jurisdictions. He commented that overall, regulators should be very careful about setting regulations that can impact fuel prices in various states. A regulator commented that earlier discussion revealed that a sunset date can be changed or implemented under certain circumstances. A state regulator cautioned that EPA allows the variation in the summer, but not in the winter. NEWMA forwarded the item to NCWM, recommending that it be a Voting item with an accelerated implementation date (30 days after passage).

At the 2015 SWMA Annual Meeting, Mr. Russ Lewis (representing API) gave a presentation. Comments were heard stating that the item is going through the ASTM process. This issue is complicated with data that needs to be reviewed; therefore, the one-year extension is needed. SWMA believes this item is fully developed and forwarded it to NCWM, recommending that it be a Voting item.

At the 2016 NEWMA Annual Meeting, an API representative gave an update on the most recent ASTM ballot for this item which closed in April and had two negatives submitted. Consequently, there are still inconsistencies regarding vapor pressure limits between NCWM regulations and ASTM language. The one-pound vapor pressure waiver needs to be extended until May 2017; otherwise, several states will have fuel that does not meet the vapor pressure requirement for gasoline. The API representative further commented that there is a chance that this issue could be resolved at ASTM by the July 2016 NCWM Annual Meeting. In the event, it is not resolved this item needs to remain as a Voting item on the NCWM L&R agenda. The State of Maine supports this item. A representative from the Society for Independent Marketers of America and National Assn. of Convenience Stores supports the item. NEWMA considers this item fully developed and supports it as a Voting item.

At the 2016 CWMA Annual Meeting, an individual from API commented they are in support of this item and it should continue to be a Voting item. A representative from Flint Hills commented that they support the item. The Committee feels this item is fully developed and is ready for Voting status.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

237-3 W Sections 2.1.3. Minimum Antiknock Index (AKI), 2.1.4. Minimum Motor Octane Number, and 3.2.5. Prohibition of Terms – Table 1.

(This item was Withdrawn.)

Source:
General Motors (2013)

Purpose:
Remove obsolete Altitude De-rating of Octane practice, establish a National Octane Baseline, and harmonize Octane Labeling from state to state.

Item under Consideration:
Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

Section 2. Standard Fuel Specification

2.1.3. Minimum Antiknock Index (AKI). – **The AKI of gasoline and gasoline-oxygenate blends shall not be less than 87.** The AKI shall not be less than the AKI posted on the product dispenser or as certified on the invoice, bill of lading, shipping paper, or other documentation**;**

(Amended 20XX)

2.1.4. Minimum Motor Octane Number. – The minimum motor octane number shall not be less than 82. ~~**for gasoline with an AKI of 87 or greater;**~~

(Amended 20XX)

Section 3. Classification and Method of Sale of Petroleum Products

3.2. Automotive Gasoline and Automotive Gasoline-Oxygenate Blends

3.2.5. Prohibition of Terms. – It is prohibited to use specific terms to describe a grade of gasoline or gasoline-oxygenate blend unless it meets the minimum antiknock index requirement shown in Table 1. Minimum Antiknock Index Requirements.

Table 1.
Minimum Antiknock Index Requirements

Term	Minimum Antiknock Index	
	~~**ASTM D4814 Altitude Reduction Areas IV and V**~~	**All ~~Other ASTM D4814~~ Areas**
Premium, Super, Supreme, High Test	~~**90**~~	91
Midgrade, Plus	~~**87**~~	89
~~**Regular Leaded**~~	~~**86**~~	~~**88**~~
Regular, Unleaded (alone)	~~**85**~~	87
~~**Economy**~~	~~**–**~~	~~**86**~~

(Table 1. Amended 1997 and **20XX**)

Background/Discussion:
These recommended changes to NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulations to the octane will harmonize with an effort underway in the ASTM International (ASTM) Gasoline and Oxygenates

Subcommittee to include a minimum motor octane number (MON) performance limit in gasoline. The naming of the various octanes is a function for weights and measures.

Nominally, vehicles manufactured after 1984 include engine computer controls maintaining optimal performance while using gasoline octane of 87-AKI or higher. The practice of altitude de-rating of octane, resulting in octanes below 87-AKI, reduces a vehicle's efficiency and fuel economy. Increasingly, more vehicles are boosted (turbocharged/supercharged) eliminating altitude intake air effects. Additionally, consumers using gasoline with an octane AKI below 87 will void their vehicle owner's warranty. The Coordinating Research Council (CRC) Report No. 660, "*Fuel Anti-knock Quality – Engine Response to RON (Research Octane Number) versus MON,*" May 2011 demonstrates the continued need for gasoline MON octane for the large bored, naturally aspirated U.S. engines. Setting an 82-MON minimum maintains the current MON level for today's 87-AKI Regular Unleaded gasoline. A common U.S. octane specification between ASTM, NCWM, and Vehicle Owners Manuals will give states clear direction on how best to enforce proper fuel pump octane labeling and quality levels on behalf of vehicle consumers.

Leaded gasoline is not available at retail and, therefore, labeling guidance is not needed.

NCWM 2013 Interim Meeting: The FALS could not reach agreement on this item during their Sunday work session. The Committee received and reviewed several letters in support of this proposal. During open hearings, Mr. Studzinski (General Motors) provided a presentation. The Committee also received comments in opposition to the proposal citing the lack of consumer complaints with suboctane and it was requested that the Committee wait until the CRC study provides data that can be used by ASTM and NCWM to determine whether or not a change is necessary. The Committee recommended this be an Informational item.

During the 2013 NCWM Annual Meeting, Mr. Hayes, FALS Chair, provided a presentation and stated that the CRC study has been expanded and finalized data is expected by year end. It was also noted the ASTM ballot failed. The Committee concurs to await a recommendation from FALS once they have considered all the data. At the 2014 NCWM Interim Meeting, Mr. Studzinski provided an update that the CRC study is almost finalized and then a ballot will be prepared for ASTM. Mr. Studzinski will have additional information for the 2015 NCWM Interim.

At the NCWM 2014 Annual Meeting, Dr. Matthew Curran, FALS Chair, remarked that the FALS is recommending this remain an Informational item until the CRC study results are complete. Mr. Bill Studzinski provided a briefing that a report should be issued in the fall of 2014.

At the NCWM 2015 Interim Meeting, the FALS Chair notified the Committee that the CRC study is still being addressed. The 2015 L&R Committee designated this as an Informational item.

At the 2015 NCWM Annual Meeting, the FALS Chair provided an update that this item was on the ASTM ballot and did not pass at the June 2015 ASTM Meeting. ASTM is evaluating the negative ballots. FALS would like to wait further action within ASTM before changes can be considered by the Conference.

At the 2016 NCWM Interim Meeting, the submitter of this proposal asked the Committee to Withdraw this item. The submitter would like to reenergize this issue through ASTM.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, there were comments from several regulators and an industry representative requesting that the item be Informational, since work is still being done by ASTM. A regulator stated that 85-octane has been prevalent in the marketplace for decades in the west and high altitude areas and this proposal would have a significant impact in the marketplace. WWMA supports ASTM's continued work and recommended that this remain an Informational item.

At the 2015 CWMA Interim Meeting, a comment from a representative of the Illinois Corn Growers suggested the Committee see a presentation by Oak Ridge Laboratories and the ASTM Octane Working Group regarding octane trends, as regulators should understand the evolution of octane requirements in gasoline. Many regulators commented on confusion regarding octane issues in their states. Since octane and volatility are the two key performance indicators, it is important to move forward with a new baseline that is optimized for today's cars and provides the best mileage

for consumers. A representative from ADM recommended this item remain Information or Developmental to allow other organizations the time to continue to work on gathering data to further vet this issue. It is the opinion of the Committee that this item is waiting on ASTM action. CWMA recommended that it remain an Informational item.

At the 2015 NEWMA Interim Meeting, the members concurred that the issue is still being vetted through ASTM and should be an Informational item.

At the 2015 SWMA Annual Meeting, the FALS Chair requested that the item be Informational, since it is a contentious item that is being addressed at ASTM. The SWMA concurred and recommended this be an Informational item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

237-4 I Sections 2.14. Products for Use in Lubricating Automatic Transmission Fluids and 3.14. Automatic Transmission Fluid. (See Related Item 232-9)

Source:
American Petroleum Institute (API) (2016)

Purpose:
Define how transmission fluids shall be identified in the marketplace on delivery documents and invoices and receipts from service.

Item under Consideration:
Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

2.14. Products for Use in Lubricating Automatic Transmissions. – Any automatic transmission fluid sold without limitation as to type of transmission for which it is intended shall meet all automotive manufacturers' recommended requirements for transmissions in general use in the state. Automatic transmission fluids that are intended for use only in certain transmissions, as disclosed on the label of its container **or on an invoice or receipt when dispensed from a receptacle, dispenser or storage tank**, shall meet the latest automotive manufacturers' recommended requirements for those transmissions. Adherence to automotive manufacturers' recommended requirements shall be based on tests currently available to the lubricants' industry and the state regulatory agency. Any material offered for sale or sold as an additive to automatic transmission fluids shall be compatible with the automatic transmission fluid to which it is added, and shall meet all performance claims as stated on the label **or on an invoice or receipt when dispensed from a receptacle, dispenser or storage tank**. Any manufacturer of any such product sold in this state shall provide, upon request by a duly authorized representative of the Director, documentation of any claims made on their product label **or on an invoice or receipt when dispensed from a receptacle, dispenser or storage tank**.

(Amended 20XX)

3.14. Automatic Transmission Fluid.

3.14.1. Labeling. – The label on a container of automatic transmission fluid **~~or~~, as well as the invoice or receipt from bulk distribution and service on an automatic transmission that includes the installation of automatic transmission fluid dispensed from a receptacle, dispenser, or storage tank** shall not contain any information that is false or misleading.

In addition, each **packaged** container shall be labeled with the following:

(a) the brand name

(b) the name and place of business of the manufacturer, packer, seller, or distributor;

(c) the words "Automatic Transmission Fluid";

(d) ~~the duty type of classification~~ **the performance claim or claims for the fluid;** and

(e) an accurate statement of the quantity of the contents in terms of liquid measure.

Each receptacle and/or storage tank of automatic transmission fluid shall be labeled with the following:

(a) the brand name;

(b) the name and place of business of the manufacturer, packer, seller, or distributor; and

(c) the performance claim or claims for the fluid; and

(d) the words "Automatic Transmission Fluid."

(Amended 20XX)

3.14.2. Documentation of Claims Made Upon Product Label. – Any manufacturer, ~~or~~ packer, **or distributor** of any product subject to this article and sold in this state shall provide, upon request of duly authorized representatives of the Director, documentation of any claim made upon their product label.

(Added 2004) **(Amended 20XX)**

Background/Discussion:
Many original equipment manufacturers (OEMs) set their own transmission fluid standards and recommend that consumers use these fluids in their designated applications. However, the current version of NIST Handbook 130 does not adequately define how transmission fluids shall be identified in the marketplace on delivery documents and invoices and receipts from service. Requiring more specific information on invoices and receipts will provide some assurance to consumers that recommended automatic transmission fluids are being installed in their cars and trucks.

The changes proposed are consistent with those approved for gasoline and diesel engine (motor) oils sold in packages or dispensed from bulk containers.

At the 2016 NCWM Interim Meeting, Dr. Curran (FALS Chair) recommended that this and (related Item 232-9) be an Informational item, so that the language can be worked on. Several members supported additional work on this proposal. Mr. Ferrick (API) will be circulating to all interested parties for review. The Committee recommended this be an Informational item.

At the 2016 NCWM Annual Meeting, Mr. Ferrick (API submitted modified language to FALS and the Committee for consideration. The Committee moved forward this new language and looks forward to receiving feedback from the Fall Regional Meetings.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Ferrick, commented that there is a need to better define ATF in the marketplace and the Automotive Oil Change Association supports this item. NIST provided some formatting edits to conform with the handbook standard. A regulator expressed concerns for the term "performance claim for fluid" which would be challenging to enforce. The WWMA recommends removing the word "package from Section 3.14.1.(a). WWMA forwarded the amended item to NCWM, recommending it as a Voting item.

2.14. Products for Use in Lubricating Automatic Transmissions. – Any automatic transmission fluid sold without limitation as to type of transmission for which it is intended shall meet all automotive manufacturers' recommended requirements for transmissions in general use in the state. Automatic transmission fluids that are intended for use only in certain transmissions, as disclosed on the label of its container **or on an invoice or receipt when dispensed from a receptacle, dispenser, or storage tank**, shall meet the latest automotive manufacturers' recommended requirements for those transmissions. Adherence to automotive manufacturers' recommended requirements shall be based on tests currently available to the lubricants' industry and the state regulatory agency. Any material offered for sale or sold as an additive to automatic transmission fluids shall be compatible with the

automatic transmission fluid to which it is added and shall meet all performance claims as stated on the label **or on the invoice or receipt when dispensed from a receptacle, dispenser or storage tank**. Any manufacturer of any such product sold in this state shall provide, upon request by a duly authorized representative of the Director, documentation of any claims made on their product label **or on an invoice or receipt when dispensed from a receptacle, dispenser, or storage tank**.

3.14. Automatic Transmission Fluid.

3.14.1. Labeling. – The label on a container of automatic transmission fluid **as well as the invoice or receipt from bulk distribution and service on an automatic transmission that includes the installation of automatic transmission fluid dispensed from a receptacle, dispenser, or storage tank** shall not contain any information that is false or misleading. ~~**In addition, each container of automatic transmission fluid shall be labeled with the following:**~~

(a) Each ~~packaged~~ container shall be labeled with the following:

(1) the brand name;

(2) the name and place of business of the manufacturer, packer, seller, or distributor;

(3) the words "Automatic Transmission Fluid";

(4) ~~**the duty type of classification;**~~ **the performance claim or claims for the fluid;** and

(5) an accurate statement of the quantity of the contents in terms of liquid measure.

(b) Each receptacle and/or storage tank of automatic transmission fluid shall be labeled with the following:

(1) the brand name;

(2) the name and place of business of the manufacturer, packer, seller, or distributor; ~~and~~

(3) the performance claim or claims for the fluid; and

(4) the words "Automatic Transmission Fluid."

3.14.2. Documentation of Claims Made Upon Product Label. – Any manufacturer, ~~**or**~~ packer, **or distributor** of any product subject to this article and sold in this state shall provide, upon request of duly authorized representatives of the Director, documentation of any claim made upon their product label.

(Added 2004) **(Amended 20XX)**

At the 2015 CWMA Interim Meeting, a comment was received from a representative of the American Petroleum Institute (API) that NIST Handbook 130 does not allow for proper identification of transmission fluids sold in states, and API supports adding new language for both the Method of Sale Regulation and the Engine Fuels and Automotive Lubricants Regulation. He indicated the term "receptacle" might need to be changed in the proposal as well as performance claim language to performance specification instead. He explained that most engine manufacturers (OEMs) have their own transmission fluid standards, unlike motor oil. An industry representative from the Automotive Oil Change Association commented that one possibility could be a part number for transmission fluid labeling. Most OEMs will provide a preferred brand as well as at least one alternate option. Industry representatives recommended this proposal continue as a Developing item. A state regulator commented this is an important proposal and should move forward, but should be fully vetted. CWMA believes that industry will continue to work on collaboration and education with regard to this item and believes the item is sufficiently developed. CWMA forwarded the item to NCWM, recommending that it be a Voting item.

At the 2015 NEWMA Interim Meeting, a representative of the American Petroleum Institute (API) commented that this item is intended to add some definition to transmission fluid so the consumer knows what they are getting, and so transmission fluid is properly labeled. A state regulator asked how the product is displayed or where it is stored at a retail oil change facility. He asked if you have a service station with a permanent tank for transmission fluid, do they pour one type over another. The API representative said that different types of transmission fluids should not be

commingled, but common ATFs from different manufacturers can be commingled. Another state regulator asked for clarification on why item d – "duty type" of classification was changed to performance claim or claims for the fluid. Some who attended the CWMA meeting commented that API made comments during the meeting regarding the change, and would provide further clarification at the 2016 NCWM Interim Meeting. NEWMA considered the item to be fully developed and forwarded it to NCWM, recommending that it be a Voting item.

At the 2015 SWMA Annual Meeting, Mr. Ferrick stated that the proposed language has been shared with the WWMA, CWMA, and NEWMA; API's Lubricants Group; AOCA; and others. API's plan is to provide an amended version in time for the NCWM 2016 Interim Meeting. It was noted that NIST provided some formatting edits and API recommends that version be submitted for inclusion into NCWM Publication 15. Dr. Curran (FALS Chair) stated that the FALS Committee would review the item and have comments for the 2016 NCWM Interim Meeting. The SWMA supported the item with the formatting changes recommended by NIST (refer to 2015 WWMA Annual Meeting and to Item 237-4). SWMA is recommended that this be a Voting item.

At the 2016 NEWMA Annual Meeting, an API representative commented that this item should remain an Informational item with new language coming in subsequent meetings. NEWMA awaits the new language and recommended that this be an Informational item.

At the 2016 CWMA Annual Meeting, Mr. Ferrick commented that it should remain Informational until additional details are compiled and presented to FALS.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

237-5 I Section 4.1. Water in Retail Engine Fuel Storage Tanks, Gasoline Alcohol Blends, Biodiesel Blends, Ethanol Flex Fuel, Aviation Gasoline, and Aviation Turbine Fuel. and 4.2. Water in Gasoline, Diesel, Gasoline-Ether, and Other Fuels.

Source:
Colorado (2016)

Purpose:
Provide a consistent best management practice regarding managing water in any engine fuel utilizing current detection technology.

Item under Consideration:
Amend NIST Handbook 130, Uniform Engine Fuels and Automotive Lubricants Regulation as follows:

4.1. Water in Retail Engine Fuel Storage Tanks. ~~**Gasoline-Alcohol Blends, Biodiesel Blends, Ethanol Flex Fuel, Aviation Gasoline, and Aviation Turbine Fuel.**~~ – No water phase greater than 6 mm (¼ in) as determined by an appropriate detection paste or other acceptable means, is allowed to accumulate in any **retail** tank utilized in the storage of **engine fuels including, gasoline,** gasoline-alcohol blend, biodiesel, biodiesel blends, **ultra-low sulfur diesel,** ethanol flex fuel, aviation gasoline, and aviation turbine fuel**, gasoline ether blends, kerosene, or any other engine fuels**.

(Amended 2008, 2012, ~~and~~ 2014**, and 20XX**)

~~**4.2. Water in Gasoline, Diesel, Gasoline-Ether, and Other Fuels. Water shall not exceed 25 mm (1 in) in depth when measured with water indicating paste or other acceptable means in any tank utilized in the storage of diesel, gasoline, gasoline-ether blends, and kerosene sold at retail except as required in Section 4.1. Water in Gasoline-Alcohol Blends, Biodiesel Blends, Ethanol Flex Fuel, Aviation Gasoline, and Aviation Turbine Fuel.**~~

~~**(Amended 2008, 2012, and 2014)**~~

Background/Discussion:
All engine fuels degrade more rapidly in the presence of water and can result in an off spec product, microbial growth, and internal corrosion of tanks and tank equipment. Besides impacting the quality of fuel such as when ethanol dissolves in water causing phase separation, affecting RVP and reducing AKI or octane number, the occurrence of microbial growth and corrosion particulates clog dispenser filters and affect other fuel clarity parameters. The fuels landscape has changed significantly across the country and currently almost all gasoline is blended with ethanol and all diesel is now Ultra Low Sulfur Diesel with up to 5 % biodiesel. This proposal provides a consistent best management practice regarding managing water in any engine fuel utilizing current detection technology (water finding paste or other acceptable means), and also simplifies the handbook by eliminating the necessity for paragraph 4.2.

At the 2016 NCWM Interim Meeting, Dr. Curran (FALS Chair) remarked that they will form an informal focus group with Mr. Albuquerque being the lead on this item. Mr. Albuquerque will be collecting additional data on this proposal. Mr. Bill Hornback (Chevron Products Co.) remarked that this is no way to detect ¼ in water. The Committee agrees that additional work needs to be done and recommends this as an Informational item.

At the 2016 NCWM Annual Meeting, Dr. Curran commented that this item was discussed extensively in the Sunday FALS meeting. It is recommended that this retain an Informational status and let the informal focus group continue to work on it. Mr. Mahesh Albuquerque (Informal Task Group Chair) provided a presentation during Open Hearing testimony.

Regional Association Comments:
At the 2015 WWMA Annual, Mr. Mahesh Albuquerque (Colorado and submitter) said this proposal would serve to protect fuel quality from degradation caused by water contamination and provides best management practices to prevent microbial growth, particulate accumulation, and tank corrosion in underground storage tanks. It would also simplify NIST Handbook 130 by eliminating redundancy. During the voting session, a regulator suggested to have data collected to support the allowance of ¼ in water phase for all the listed products. WWMA forwarded the item to NCWM, recommending it be a Voting item.

At the 2015 CWMA Interim Meeting, multiple state regulators support this proposal as a Voting item. CWMA believes it sufficiently developed to forward to NCWM, recommending that it be a Voting item.

At the 2015 NEWMA Interim Meeting, no comments were heard and this item was forwarded to the NCWM, recommending that it be a Voting item.

At the 2015 SWMA Annual Meeting, Mr. Walter Huff (Mississippi Petroleum Marketers Assoc.) spoke in opposition of this item. The Committee heard several comments from state officials and industry that support this item. The SWMA believes the item is fully developed and forwarded it to NCWM recommending it as a Voting item.

At the 2016 NEWMA Annual Meeting, the NIST Technical Advisor commented that an informal focus group met at the beginning of May to discuss this item, and indicated the notes from the working group's conference call along with a PPT presentation are posted on the L&R Committee website. A state weights and measures official commented that the title "Retail Engine Fuel Storage Tanks" is awkward. Another option is "Retail Storage Tanks for Engine Fuel." An industry official recommended the need for differentiation from other fuel storage tanks (such as at bulk terminals). Another state weights and measures official asked if the many K1 (kerosene) tanks would be exempt from this provision. He recommends taking out the word "Engine." NEWMA recommended that this item remain Informational.

At the 2016 CWMA Annual Meeting, Mr. Scott Simmons (Colorado) made comments on behalf of the informal task group on water in storage tanks. Mr. Simmons commented that all engine fuels are affected negatively by water, and the occurrence of microbial growth clogs filters and damages fuel systems. Currently, almost all gasoline is blended with ethanol and all diesel is ultra-low sulfur diesel. The absence of sulfur, which is a natural biocide, leaves fuel systems more vulnerable. The proposal puts all requirements in one place and makes the requirement consistent across different types of fuels. A representative from API commented that he believes the item should continue to remain Informational because not all fuel is blended with biodiesel or has ethanol in it. The Committee feels that this item should remain Informational for additional input from stakeholders.

237-6 V Section 4.3. Dispenser Filters

(This item was returned to the Committee.)

Source:
Missouri Department of Agriculture (2012)

Purpose:
Recognize the need for 10 micron or smaller nominal pore-sized filters for today's diesel engines.

Item under Consideration:
Amend the NIST Handbook 130, Engine Fuels and Automotive Lubricants Regulation as follows:

4.3. Dispenser Filters.

4.3.1. Engine Fuel Dispensers.

(a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, ethanol flex fuel, and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.

(b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a ~~**30**~~ **10** micron or smaller nominal pore-sized filter **with the following exceptions:**

(1) Dispensers with flow rates greater than 15 gal per minute shall use a 30 micron or smaller nominal pore size filter.

(2) Dispensers with flow rates less than or equal to 15 gal per minute in the following states may use a 30 micron or smaller nominal pore size filter during the months of December through March. These states include: Nevada, Idaho, Montana, Wyoming Colorado, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Michigan, Illinois, Pennsylvania, New York, Vermont, New Hampshire, and Maine. This exception has a sunset date of April 2020.

(3) Dispensers with flow rates less than or equal to 15 gal per minute in North Dakota may use a 30 micron or smaller nominal size filter during the months of November through March. This exception has a sunset date of April 2020.

(Amended 2014 **and 20XX**)

Background/Discussion:
Abnormal dispenser filter plugging at retail will alert the retailer of potential storage tank problems. Requiring 10-micron filters for all products will reduce the inventory and the potential of installing the wrong filter for all products at the same site.

At the NCWM 2012 Interim Meeting, Mr. Ronald Hayes, FALS Chair, informed the Committee that FALS recommended that this be an Informational item due to industry concerns that 10-micron filters would be too restrictive of flow in high-flow systems. One industry representative expressed opposition for the use of 10 micron filters and recommends this item to be Withdrawn. A representative of an automobile manufacturer claimed diesel passenger vehicles do not have the sophisticated filtration systems commonly found on commercial duty vehicles and 10-micron filters on dispensers are needed for protection from particulate contamination. As proposed, this item could cause clogging of diesel dispenser filters in colder climates. The Committee believes this item has merit but lacks a consensus and believes that FALS needs to address these concerns. The 2012 L&R Committee designated this item as an Informational item and assigned it to FALS for further development.

At the 2012 NCWM Interim Meeting, it was apparent to the Committee that there are many unresolved issues related to passenger vehicles. The Committee encourages the FALS to continue Developing this item.

At the 2012 NCWM Annual Meeting, several stakeholders spoke in opposition of this item. Mr. Ronald Hayes, FALS Chair, remarked that the FALS worked on this item in 2007 and believes FALS needs to continue to work on this item. The NCWM L&R Committee agreed that this item is not ready and supports the continued development by FALS.

At the 2013 NCWM Interim Meeting, Mr. Hayes remarked that a similar item was brought before the Committee in 2007. FALS did not have enough time in their work session to work on this item. There are several stakeholders and states that are having issues with the terminology and would like it removed from the agenda. Mr. Hayes (Missouri) remarked that they supported this item because contamination is an issue with cars that do not have filtering systems. The Committee reviewed comments from the regional associations; however, FALS did not have sufficient time review and make a recommendation to the Committee. The Committee would like for FALS to continue to work on this item and is proposing this as an Informational item.

At the 2013 NCWM Annual Meeting, Mr. Hayes requested that the Committee allow them to continue to work on a recommendation for this item. There was opposition on moving this item forward. In less than two years since this proposal came forward, there has been no data developed. The Committee reviewed Regional Association reports, open hearing comments and letters received and changed the status of this item to Developing.

At the 2014 NCWM Interim Meeting, Mr. Hayes, who submitted the proposal, offered modified language and supporting data to support the flow rate on 10-micron diesel filters. There was considerable discussion regarding the fill time reduction, burdensome cost for station owners, and equipment and filter maintenance. It was noted that there is work being done within ASTM but at this time that information cannot be shared. The Committee reviewed the Item Under Consideration within NCWM Interim Publication 15 (2014). The Committee moved forward the modified language provided by Mr. Hayes for consideration as a Voting item.

At the 2014 NCWM Annual Meeting, the Committee reviewed several letters and additional data submitted by the Petroleum Marketers Association of American (PMAA). The FALS recommended this item move forward for a Vote. During open hearings, comments were mixed regarding this item. Numerous concerns were expressed concerning the data from PMAA. Several comments were heard that ASTM should be allowed to develop a standard.

At the 2015 NCWM Interim Meeting, the FALS Chair notified the Committee that this proposal was discussed in their work session and the FALS group is divided on a recommendation. Mr. Russ Lewis (Marathon Petroleum Co.) submitted the CRC Report "Diesel Fuel Storage and Handling Guide." In addition, Mr. Prentiss Searles (API) provided the Committee with a listing of the various studies and the findings, which support moving this item forward. The Committee reviewed additional letters and regional association recommendations. During Open Hearing testimony, there was discussion as to whether this is a weights and measures issue or a housekeeping issue for the stations. There was lengthy discussion as to the type of particulates and contaminates that a 10 micron could filter. Cost effectiveness was a concern as to who would bear the burden of this cost. With the extensive discussion on this subject matter and new information received the Committee is designating this item as a Voting item.

At the 2015 NCWM Annual Meeting, Mr. Lewis (on behalf of API) provided a presentation on dispenser filters. Mr. Curran (FALS Chair) informed the Committee that FALS is divided on this issue but would like it to proceed with a Vote. There were no new comments other than those that have already been provided in this report. The outcome of the voting session was a split vote; therefore, it was returned to the Committee.

At the 2016 NCWM Interim Meeting, Mr. Searles provided a presentation and remarked that North Dakota is being stricken from Section 4.3.1.(b)(2). Dr. Curran (FALS Chair) remarked that FALS had some opposition from marketers on this proposal. However, FALS is recommending this move forward as a Voting item. There was discussion on the floor as to who is responsible for clean tanks, refiners, terminals, or retailers? It was also mentioned that the ASTM standard may not be sufficient. The Committee is recommending this as a Voting item.

At the 2016 NCWM Annual Meeting, Dr. Curran recommended the item move forward with a Vote even though FALS could not reach a consensus on this item. There were several remarks that this item should be Withdrawn due to the financial burden it would have on small independent operators. Oregon, Maine, and Massachusetts requested that they be added to the exemption listing. States were added to the exemption listing based on temperature studies in the ASTM D975 10 percentile ambient temperature tables (fig. X 5.2. and 5.3.) Those in support of this proposal

agreed that studies on fuel cleanliness have been done, and this item protects the consumer and adds the last line of defense and stations must maintain their tanks. However; retail stations claim contamination is in the product that is being delivered. There was also a comment as to how the sunset date of April 2020 was determined. Mr. Russ Lewis (Marathon Petroleum) remarked that the sunset date was proposed so that if adopted and this did not resolve the issue, then it would allow for a switch back to the 30-micro filter. During the voting session, the item didn't pass or fail and so it was returned to the Committee.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, Mr. Prentiss Searles (API) gave a presentation and provided the following information:

All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a ~~30~~ 10 micron or smaller nominal pore-size filter ~~**except for dispensers with flow rates greater than 15 gallons per minute which shall have a 30 micron or smaller nominal pore size filter**~~ with the following exceptions:

1. Dispensers with flow rates greater than 15 gal per minute shall use a 30 micron or smaller nominal pore size filter.

2. Dispensers with flow rates less than 15 gal per minute in the following states may use a 30 micron or smaller nominal pore size filter during the months of December through March. These states include: Nevada, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Michigan, Illinois, Pennsylvania, New York, Vermont, New Hampshire, and Maine. This exception has a sunset date of April 2019.

3. Dispensers with flow rates less than 15 gal per minute in North Dakota may use a 30 micron or smaller nominal pore size filter during the months of November through March. This exception has a sunset date of April 2019.

A regulator was concerned with problems related to low temperatures in above ground diesel fuel storage tanks. Another regulator was concerned with the proposed sunset date approaching quickly. WWMA recommends the revised language that appears below be recommended as a Voting item. This will address concerns for cold flow, which were raised at previous meetings. WWMA recommended that the item be a Voting item with the following language:

4.3. Dispenser Filters.

4.3.1. Engine Fuel Dispensers.

(a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, ethanol flex fuel, and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.

(b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a ~~**30**~~ **10** micron or smaller nominal pore-sized filter **with the following exceptions:**

(1) Dispensers with flow rates greater than 15 gal per minute shall use a 30-micron or smaller nominal pore size filter.

(2) Dispensers with flow rates equal to or less than 15 gal per minute in the following states may use a 30-micron or smaller nominal pore size filter during the months of December through March. These states include: Nevada, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Michigan, Illinois, Pennsylvania, New York, Vermont, New Hampshire, and Maine. This exception has a sunset date of April 2020.

(3) Dispensers with flow rates equal to or less than 15 gal per minute in North Dakota may use a 30 micron or smaller nominal pore size filter during the months of November through March. This exception has a sunset date of April 2020.

(Amended 2014 **and 20XX**)

(Added 2008) (Amended 2014 **and 2016**)

At the 2015 CWMA Interim Meeting, a state regulator supported the language provided by API at the 2015 WWMA Annual Meeting. This modified language provides some flexibility to utilize a 10-micron filter in warm weather and switch back to 30-micron filter during cold weather months in specified states. This language also has sunset dates, which allows for the eventuality of standardized 10-micron filters on all diesel dispensers with a flow rate of 15 gpm or less. An industry representative from the fuel marketers spoke in opposition of this proposal. A state regulator commented that she would encourage ASTM to develop a tighter specification for fuel purity rather than rely on filters to catch particulate matter. The CWMA believes this item is fully developed and industry has sought a reasonable compromise position, and recommends the API version of this move forward as a Voting item.

At the 2015 NEWMA Interim Meeting, the L&R Chair presented the revised proposal submitted at the WWMA. A state regulator commented that with the new item to limit water, he does not think this item should move forward. They further commented that state exceptions from the industry proposal, presented at the WWMA, seems arbitrary. NEWMA recommended that this be a Voting item.

At the 2015 SWMA Annual Meeting, Mr. Russ Lewis (representing API) provided a presentation and following revisions. The SWMA accepts the revisions and believes this item is fully developed. The SWMA recommends that the revised language submitted (refer to the 2015 WWMA Annual Report) be a Voting item.

At the 2016 NEWMA Annual Meeting, an industry representative from Gilbarco commented that the current provision differentiates the requirement for flow rates of 15 gpm or greater. He suggested considering changing the flow rate exemption threshold from 15 gpm to 30 gpm since that rate is already referenced as a high flow rate in NIST Handbook 44. This item was considered fully developed and NEWMA recommends this as a Voting item.

At the 2016 CWMA Annual Meeting, a state regulator from Missouri commented that this proposal came from an update in Missouri's state fuel quality requirements and commented that regardless of whether diesel fuel has biodiesel in it or not is irrelevant – the fuel needs to be cleaner. He added that a recent volume of the PEI (Petroleum Equipment Institute) Journal has an article about coverage of current NCWM items being considered. He said that the article points out that off-road equipment has better coverage and protection when it comes to fuel quality, but a customer at a retail station is at the mercy of what fuel housekeeping practices the retail fuel station operator provides. A representative from API commented they support the proposal. During the voting session, a state regulator from Illinois spoke in support of the item. A state regulator from Missouri commented that the current language is a compromise from the original proposal and addresses some of the concerns fuel marketers had regarding cold weather issues. A state regulator from Minnesota commented that she supports a workmanship standard on all fuels at all levels. She believes the item is fully developed and ready for Voting status. The CWMA also agreed this should be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

260 HANDBOOK 133

260-1 V Section 1.2.1. Inspection Lots and Section 3.10. Mulch and Soils Labeled by Volume

(The Committee returned this item to Informational status.)

Source:
Mulch & Soil Foundation and NIST OWM (2016)

Purpose:
Clarify test procedures and promote uniform practices.

Item under Consideration:
Amend NIST Handbook 133 as follows:

Chapter 1- General Information

1.2. Package Requirements

1.2.1. 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 the lot **in accordance with Section 1.3. Sampling Plans and section 2.3.4. Random Sample Selection**. 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.

Chapter 3 – Test Procedures – For Packages Labeled by Volume

3.10. Mulch and Soils Labeled by Volume

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."

3.10.1. Test Equipment:

- 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"
- Drop cloth/polyethylene sheeting for catching overflow of material
- Level (at least 15 cm [6 in] in length)

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

Nominal Capacity of Test Measure[4]	Actual Volume of the Measure	Interior Length[1]	Interior Width[1]	Interior Height[2]	Marked Intervals on Interior Wall[3]	Volume Equivalent of Marked Intervals
30.2 L (1.07 cu ft) for testing packages that contain less than 28.3 L (1 cu ft or 25.7 dry qt)	31.9 L (1.13 cu ft)	213.4 mm (8.4 in)	203.2 mm (8.0 in)	736.6 mm (29 in)	12.7 mm ($^1/_2$ in)	550.6 mL (33.6 cu in)
28.3 L (1 cu ft)	~~28.3 L (1 cu ft)~~ **33.04 (1.16 cu ft)**	304.8 mm (12 in)	304.8 mm (12 in)	~~304.8 mm (12 in)~~ **355.6 mm (14 in)**		1179.8 mL (72 cu in)
56.6 L (2 cu ft)	~~63.7 L (2.25 cu ft)~~ **61.3 L (2.16 cu ft)**	304.8 mm (12 in)	304.8 mm (12 in)	~~685.8 mm (27 in)~~ **660.4 mm (26 in)**		
		406.4 mm (16 in)	228.6 mm (9 in)	~~685.8 mm (27 in)~~ **660.4 mm (26 in)**		
84.9 L (3 cu ft)	~~92 L (3.25 cu ft)~~ **89.4 L (3.16 cu ft)**	304.8 mm (12 in)	304.8 mm (12 in)	~~990.6 mm (39 in)~~ **965.2 mm (38 in)**		
		406.4 mm (16 in)	228.6 mm (9 in)	~~990.6 mm (39 in)~~ **965.2 mm (38 in)**		

Measures are typically constructed of 1.27 cm ($^1/_2$ in) marine plywood. **The measure must accommodate the entire contents of the package being tested, and** 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

[1.] Other interior dimensions are acceptable if the test measure approximates the configuration of the package under test, **can accommodate the entire contents of the package at one time** and does not exceed a base configuration of the package cross-section.

[2.] The height of the test measure **shall be 355.6 mm (14 in) for a 1 cu ft package, 660.4 mm (26 in) for a 1.5 – 2 cu ft package or 965.2 mm (38 in) for a 3 cu ft package**. ~~**may be reduced, but this will limit the volume of the package that can be tested.**~~

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

[3.] 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.

[4.] The Nominal Capacity is given to identify the size of packages that can be tested in a single measurement using the dry measure with the listed dimensions. It is based on the most common package sizes of mulch in the marketplace. If the measures are built to the dimensions shown above the actual volume will be larger than the nominal volume so that plus errors (overfill) can be measured accurately.

(Amended 2010 **and 20XX**)

3.10.2. Test Procedure

1. Follow the Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection, and select a random sample.

~~**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.**~~

2. ~~**Note**~~ Some types of mulch are susceptible to clumping and compacting. ~~**Take steps**~~ **T**o ensure that the material is loose and free flowing when placed into the test measure**, g**ently **massage the package while** roll**ing** the bag **on the ground (or flat surface) at least four full rotations (but not more than eight full rotations), without lifting or dropping the package,** before opening to reduce the clumping and compaction of the material.

Note: Mulch products stored exposed to the elements may become saturated with moisture. Excessive moisture adds weight to mulch particles and distorts the volume test results. Test samples with flowing or excessive collected moisture in the package shall be excluded from the test procedure.

~~**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.**~~

3. Placing contents into the test measure.

- **Open the bag, gather the bag opening to ensure that no product is lost. Place the gathered bag opening as far into the top of the measure as possible without disturbing or leaning against the measure.**

- **Release the bag opening and quickly dump the contents of the package into a test measure in a continuous flow**

Note: Do not touch the product or disturb the test measure by rocking, shaking, dropping or tamping it during the test procedure.

- **Massage the outside of the bag to maintain a continuous flow of the product but not for the purpose of de-clumping the product.**

- **Using your hand, gently level the contents, being careful not to affect the compaction of the product.**

4. Read the horizontal marks at a position level with the product and round the readings between

two marked intervals up to the nearest 38.1 mm (½ in) increment to determine the package net volume.

5.4. 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

(Amended 20XX)

3.10.3. Evaluation of Results

Follow the procedures in Section 2.3.7. "Evaluate for Compliance" 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 50 Items or Fewer, and Specific Agricultural Seeds Labeled by Count, 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.

Background/Discussion:
Recent observations of test activities being conducted by industry and states indicate there are areas in the current test procedures that are not sufficiently defined to assure uniform testing practices by all parties. Council testing conducted by Dr. William Fonteno (Horticultural Substraits Lab at North Carolina State University) indicates some reported and observed variations in testing procedures that are not completely defined in NIST Handbook 133 can have an adverse impact on testing results due to the highly variable particle size distribution that is the very nature of the products.

There should be no major costs resulting from this proposal. Some manufacturers and inspectors may need updated test measures suitable for the package size being tested. All stakeholders will benefit from coordinated training by NIST and industry and the uniform application of test procedures in interstate commerce.

At the 2016 NCWM Interim Meeting, it was noted that this proposal clarifies the language of the testing procedures that are currently within NIST Handbook 133. It was noted that the language in Section 1.3.1. Audit Test, which stated "Do not take enforcement action using audit test results," should be underlined and bold in NIST Handbook 133. Since the change is not a technical correction or clarification, the language was removed from the Item Under Consideration.

The Committee made the following changes

- Remove the term "statistically valid" from Section 1.2.1.

1.2.1. 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 statistically valid, randomly drawn** sample ~~**drawn from**~~ **of** 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.

- Under 3.10.2. Test Procedure modified the second sentence in the note to read: Test samples with flowing or **excessive** collected moisture in the package shall be excluded from the test procedure.

With the modifications stated above the Committee is recommending this be a Voting item.

At the 2016 NCWM Annual Meeting, Mr. Robert LaGasse (MSC) remarked that this clarifies the current test procedures in NIST Handbook 133. Mr. Floren (Los Angeles County, California) remarked that he has no issue with the inspection procedure, but he has major concerns with Section 1.2.1. This section applies to all products in the marketplace, and for that reason, this portion of the proposal should be stricken. The handbook already states how a random selection is to be done. Mr. Mike Sikula (New York) opposed this item because it is difficult to pour the product into the test measure without touching. Mr. Craig VanBuren (Michigan) asked for the supporting data regarding the change in the test measure size. It was also suggested that the term "excessive moisture" is too subjective.

The Committee made the following changes

1.2. Package Requirements

1.2.1. 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 **~~randomly drawn~~** sample **drawn from ~~of~~** the lot **in accordance with Section 1.3. Sampling Plans and Section 2.3.4. Random Sample Selection**. 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.

The Committee made a minor editorial change to the note in Section 3.10.2.3. by removing the word "touching" and replacing it with the word "disturbing."

At the Voting session, a motion to amend was heard from the State of Michigan. This motion was to Withdraw the Table 3-4. Test Measure size until further data can be submitted on why this change is valid. The Committee removed this item from Voting status and noted the following concerns.

1. Additional testing needs to be done on the use and variability of the various test vessels sizes. This data should be shared with membership in advance of any meetings.

2. Modify the language to state that the measurement must be made in a single pour. In stating this, the specifications for the current test measurement are not changed.

3. Concern was voiced regarding the cost of building new test vessels. *Possible solution:* Permit the use of the current test vessels, but have a note that test vessels constructed after a specific date use the new recommended chart.

4. The current practice and use of test measures has been used for an extended period, why is this change before the Conference? The product has not changed, so why is there a proposal before the Conference?

5. When there is "excessive moisture the package is not to be tested. However, because this product is stored outside it could be could be affected by the various weather climates (i.e., rain, sleet, ice, humidity, snow). In some regions, once the product gets wet and then has exposure to freezing temperatures it never dries out. The term "excessive moisture" is too subjective.

6. Replacing the word "touch" with "disturb(ing)" in the test procedure has been a sufficient resolution and this modification will appear in the fall regional reports to get additional feedback.

3. Placing contents into the test measure.

- **Open the bag, gather the bag opening to ensure that no product is lost. Place the gathered bag opening as far into the top of the measure as possible without disturbing or leaning against the measure.**

- **Release the bag opening and quickly dump the contents of the package into a test measure in a continuous flow**

Note: Do not touch the product or disturb the test measure by rocking, shaking, dropping or tamping it during this procedure.

Regional Association Comments:
The WWMA received a presentation from Mr. Robert LaGasse, Executive Director of Mulch and Soil Council, to discuss the proposal, which is a joint effort with NIST. The proposal does not change the procedures, but clarifies the steps that are not being interpreted in the same manner by the states and industries. Changes will promote uniformity. The WWMA supports this item with amendments. Bold and underline the statement "Do not take enforcement action using audit test results" in 1.3.1. Audit Tests. This is meant to bring to the inspectors' attention the fact that enforcement action should not be taken unless an official test has been conducted.

During the voting session, Mr. Floren (Los Angeles County, California) was concerned about the term "randomly drawn" as it relates to drawing a sample for items in large quantities. This term would cause challenges in conducting the inspection and when facing legal challenges in civil cases. He stated that this addition would apply to all commodities and not only mulch and soils. He recommended removing the suggested addition of "randomly drawn," and bold the sentence "Do not take enforcement action using audit test results," and agrees with the suggested changes for Chapter 3, Section 3.10. Mulch and Soils Labeled by Volume. The WWMA forwarded the item to NCWM, recommending that it be a Voting item as modified:

1.2.1. 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 ~~**statistically valid,**~~ **randomly drawn** sample ~~**drawn from**~~ **of** the lot **in accordance with 1.3. Sampling Plans**. 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.

At the 2015 CWMA Interim Meeting, a state regulator asked if this proposal would conflict with the proposal that includes a maximum allowable variation. She wants any conflict between the two proposals related to MAVs resolved before moving forward. She recommended it not move forward as a Voting item. The Committee believed there was still potential for conflict regarding maximum allowable variation; therefore, the CWMA forwarded the item to NCWM and recommended that it be a Developing item.

At the 2015 NEWMA Interim Meeting, a state regulator commented that this should continue as a Developing item. He does not support this method as it is presented because he believes the act of sifting needs to stay in the test method. He would like to see more data in varying climates where moisture exists. Another state regulator commented that this proposal states that this product is similar to animal bedding and the procedures seem to be very different. This proposal does not allow multiple drops, and the animal bedding procedure does allow for multiple drops. He believes this is inconsistent and should be reevaluated. Another regulator agrees it should remain as a Developing item waiting for further data from various climates. NEWMA forwarded the item to NCWM, recommending that it be a Developing item.

At the 2015 SWMA Annual Meeting, Mr. Robert LaGasse (Mulch and Soil Council) spoke in support of this proposal. The SWMA proposes adding the word "excessive" into Section 3.10.2. Test Procedure, Step 2. With this change, the SWMA forwarded the item to NCWM, stating that it is fully developed and recommended that it be a Voting item.

Note: Mulch products stored exposed to the elements may become saturated with moisture. Excessive moisture adds weight to mulch particles and distorts the volume test results. Test samples with flowing or excessive collected moisture in the package shall be excluded from the test procedure.

At the 2016 NEWMA Annual Meeting, Mr. LaGasse commented that these changes are clarifications for NIST Handbook 133 in order to make language consistent with existing training practices and to cover gaps discovered from these training sessions. A state weights and measures official from New York commented that he is not sure there is a need for the language "randomly drawn" in this introductory paragraph since this is covered in the existing testing procedures. The NIST Technical Advisor commented that the phrase was added in this introductory section for clarification. A state weights and measures official from Connecticut asked if there had been any further study on these procedures. The NIST Technical Advisor commented there had been a great deal of testing, and NIST would be interested in hearing feedback from inspectors using this method in the field. The regulator from Connecticut further commented he had concern with the term "dumping quickly." The representative from the Mulch and Soil Council commented the important step was to massage and roll the package as indicated in the testing methods to break up the material. The New York state official opposed this item because the procedure is too detailed and too constraining to be used in practice. The NIST Technical Advisor commented that inspectors were tapping, knocking, and rocking the measure during training, and these procedures are meant to address that practice. Mr. LaGasse indicated that the test method has always included guidance for no rocking, tapping, or knocking for twenty years but inspectors are at times using these methods. The New York state official commented that the new language calls for not touching the measure, and that is too restrictive. NEWMA believed this item is fully developed and should remain Voting.

At the 2016 CWMA Annual Meeting, Mr. LaGasse commented that this is a joint proposal between the Mulch and Soil Council and NIST to clarify procedures for checking package content of mulch. This proposal updates procedures for containers in the testing protocol. These procedures have been developed from the NIST training sessions so that industry and states can both reference the same materials if training is unavailable. Industry supports the proposal as a Voting item. The L&R Chair commented that the Conference received a letter from Professor Judd Michael (Pennsylvania State University, College of Agricultural Sciences and Engineering) stated that they did not support the proposed changes. Professor Michaels wrote that he is concerned the new procedures will result in more issues rather than fewer issues. The Chair commented that NIST has reached out to the individual to clarify the specific concerns. The Committee felt that the proposal should move forward as a Voting item, with the expectation that NIST will continue communication with Dr. Michael, and he will have the opportunity to attend the Annual Meeting to present his concerns.

260-2 V Section 2.4. Borax Audit Test

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Provide clarification for existing steps for the Borax Test Procedure.

Item under Consideration:
Amend NIST Handbook 133 as follows:

2.4. Borax Audit Test

This audit test is only used if the sample fails a net weight test. This method is used to identify possible short-filling by weight at point-of-pack for borax. Since the density of borax can vary at point-of-pack, further investigation is required to determine whether such short-filling has occurred. ~~**Use the following procedure 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. Use the following procedure to determine if packages of borax are labeled correctly.~~**Such commodities are**~~ **Borax shall be** labeled by weight. 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**~~ borax 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.**~~

(Amended 2016)

2.4.1. Test Equipment

- ~~**Metal density cup**~~ **Dry measure** with a capacity of 550.6 mL (1 dry pt), 1101 mL (dry quart), 1000 mL (liter)
- Metal ~~**density**~~ funnel with slide-gate and stand
- ~~**Scale or balance having a scale division not larger than 1 g or (0.002 lb),**~~ **A scale that meets the requirements in Chapter 2, Section 2.2. "Measurement Standards and Test Equipment."**
- ~~**Rigid**~~ **S**traightedge or ruler
- **Safety glasses**
- **Gloves**
- **Dust mask**
- **Level (at least 15 cm [6 in] in length)**
- Pan or drop cloth/polyethylene sheeting ~~**suitable**~~ for ~~**holding**~~ **catching** overflow of ~~**density cup**~~ **dry measure**
- **Borax Audit Worksheet**

2.4.2. Test Procedure

Use this procedure only if the sample fails to meet the package requirements in Section 2.3.7. "Evaluate for Compliance."

1. ~~**Follow Section 2.3.1. through 2.3.7. to define the inspection lot, use a "Category A" sampling plan in the inspection; select a random sample, determine tare and package errors and evaluate results.**~~ **Select the package with the lightest gross weight. Fill out Boxes 1 through 3 of the Borax Audit Worksheet.**

2. ~~**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.**~~ **Record the volume declared on the package (Box 4). This volume declaration shall not appear on the principal display panel. Instead, it shall appear on the back, side, or bottom of the package and may read as:**

   Volume _____ mL per NIST Handbook 133

   Note: 1 mL = 1 cm^3

3. Determine the ~~**empty weight of the density cup.**~~ **gross weight of the package (Box 5).**

4. ~~**Place the density cup in the pan and put the funnel on top of the density cup. Close the funnel slide-gate.**~~ **Look up the dry measure used in the following table and record the volume (Box 8).**

Dry Measure	Volume in Milliliters
Dry Pint	550.6 mL
Dry Quart	1101 mL
Liter	1000 mL

5. ~~Pour sufficient commodity into the funnel so that the density cup can be filled to overflowing.~~ Determine the empty weight of the dry measure and record the value (Box 9).

   (a) Place the dry measure in the pan or on top of drop cloth/polyethylene sheeting and verify that it is level. Place the funnel on top of the dry measure and close the funnel slide gate.

   (b) Pour an adequate amount of borax into the funnel so that the dry measure will be filled to overflowing.

   (c) Quickly remove the slide-gate from the funnel, allowing the borax to flow into the dry measure. To ensure that the borax is free-flowing, repeat Steps 5 (a), (b), and (c) at least three times. After the final filling go to Step 5 (d).

   (d) Carefully, without agitating the dry measure, remove the funnel and level off the borax with the straightedge or ruler at a right angle to the rim of the cup, and carefully draw it across the top of the dry measure to leave an even surface. If the surface of the borax is not smooth, repeat Steps 5 (a), (b), (c), and (d). If the surface of the borax is smooth, proceed to Step 6.

6. ~~Quickly remove the slide-gate from the funnel, allowing the commodity to flow into the density cup.~~ Determine the gross weight of the filled dry measure and borax (Box 10).

7. ~~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.~~ Subtract the empty weight of the dry measure from the gross weight of the dry measure (Box 10 – Box 9) to obtain the net weight of the borax in the dry measure (Box 11).

8. ~~Weigh (in pounds) the filled density cup to determine gross weight. Subtract the empty density cup in weight from the gross weight. This will give the net weight of the commodity.~~ Determine the tare weight of the package (Box 6).

9. ~~Multiply the package net weight (in pounds) found for the package under test by 550.6.~~ Determine the net weight of package (Box 7).

10. ~~Divide the answer just obtained (Step 9) by the weight of the commodity in the density cup determined in Step 8 above. The result is the net volume of commodity in the package in milliliters.~~

~~11. Compare the net volume of the commodity in the package with the volume declared on the package. The volume declaration must not appear on the principal display panel. Instead, it will appear on the back, side of the package and may appear as:~~

~~Volume ____ mL per NIST Handbook 133~~

~~Note: 1 mL = 1 cm^3~~

Determine the net volume of the borax by dividing the net weight of the package (Box 7) by the net weight of the borax in the dry measure (box 11) and multiply the result by the volume of the dry measure (Box 8). The result is the net volume of the borax in the package in milliliters (Box 12).

~~12.~~ If the net volume of ~~commodity~~ **borax** 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.

~~13.~~ 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~~ **borax**.

(Amended 2016)

Borax Audit Worksheet **Use only IF the sample fails the net weight test. Use the lightest package in the sample.**	
1. Product:	**2. Lot Code:**
3. Declared Net Weight on the Package:	
4. Declared Volume on the Borax Package:	
5. Gross Weight of Package:	
6. Tare Weight of Package:	
7. Net Weight of Package:	
8. Volume of Dry Measure - look up the volume of the dry measure in milliliters used to calculate the volume and enter it below: **= mL** **Dry Measures: Dry Pint = 550.6 mL; Dry Quart = 1101 mL; Liter = 1000 mL**	
9. Empty Weight of Dry Measure:	
10. Gross Weight of Dry Measure + Borax:	
11. Net Weight of Borax in the Dry Measure (Box 10 − Box 9 =):	
12. Net Volume of Borax (Box 7 ÷ Box 11) × Box 8 =:	
13. Refer to Step 10 to determine if the sample is in compliance or if further action is required.	

Background/Discussion:
NIST, OWM has taught several classes for NIST Handbook 133 Basic and incorporated the Borax procedure as one of the hands-on training modules. Based on comments and recommendations received from the students, NIST has concluded that the current test procedure needs clarification regarding the test equipment and steps that are in the current edition of NIST Handbook 133. NIST is also proposing adding a Borax Audit Worksheet to NIST Handbook 133 – Appendix C to assist inspectors in performing the test.

At the 2016 NCWM Interim Meeting, the NIST Technical Advisor remarked that these modifications clarify the language within NIST Handbook 133. This testing procedure has been used in several NIST Handbook 133 Basic

Training Seminars. Several of these changes result from feedback received from the students. Ms. Kristin Macey (California) noted that the step-by-step procedures are not correct. NIST will review the procedure and make any necessary corrections before the spring regionals. The Committee is recommending this be a Voting item.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, the NIST Technical Advisor remarked that several clarifications were made to the procedure based on input from several NIST Handbook 133 Basic Training Seminars. The WWMA forwarded this item to the NCWM, recommending that it be a Voting item.

At the 2015 CWMA Interim Meeting, there were no comments or new information presented. The CWMA believes the item to be fully developed and forwarded it to NCWM with the recommendation that it be a Voting item.

At the 2015 NEWMA Interim Meeting, no comments were heard. NEWMA believes this item is fully developed and recommends it as a Voting item.

At the 2015 SWMA Annual Meeting, the NIST Technical Advisor remarked that this clarifies the current procedure, which is being used in the NIST Training Handbook 133 Basic Seminar. The SWMA recommends this be a Voting item.

At the 2016 NEWMA and CWMA Annual Meetings, no comments were heard and both regions are recommending this be a Voting item.

260-3 V Section 3.14. Firewood – Volumetric Test Procedures for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less) and Stacked Firewood sold by the Cord or fractions of a Cord. (See Related Items 232-4 and 260-4)

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Replace ambiguous test procedures with new procedures that will provide improved national uniformity in test results.

Item under Consideration:

3.14. Firewood – (Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3]) or Less and Stacked Firewood sold by the Cord or fractions of a Cord.

Unless otherwise indicated, take all measurements without rearranging the wood or removing it from the package. **However,** 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 according **to the procedures described in this section. For boxed firewood, it is the volume of the wood in the box that is determined not the volume of the box.**

Note: The implementation date for this is effective July 1, 2017.

3.14.1. Test Equipment ~~Linear Measure. Take all measurements in increments of 0.5 cm ($^3/_{16}$) or less and round up~~

Linear Measurement: the maximum value of graduations on a ruler or tape shall be equal to or less than:

For testing packaged firewood: SI Units – 1 mL or for U.S. customary units – $^1/_{16}$ in (0.0625 in).

For testing stacked firewood: SI Units – 0.5 cm or for U.S. customary units – $^1/_8$ in (0.125 in).

Other Equipment:

Except where a long tape measure is needed for measuring stacks of wood and unless otherwise noted below, a precision tempered steel ruler should be used for linear measurements. Current calibration certificates issued by a NIST recognized or accredited laboratory should be available for all measuring devices.

- **To test boxes of firewood, use a straightedge and a 150 mm (6 in) tempered steel pocket ruler to measure the box headspace. A rigid 610 mm (24 in) tempered steel ruler is required to measure piece length and the dimensions of the box.**

- **To test bundles of firewood, use a rigid 610 mm (24 in) tempered steel ruler to measure typical piece length. If the circumference based auditing method is to be conducted, a precision 610 mm (24 in) diameter (pi) tape or flexible steel tape with 1 mm ($\frac{1}{16}$ in) graduations may be used to approximate the package volume for screening and audit purposes.**

For testing stacks of firewood, a precision tape or long tape measure are used. For testing bundles and bags of firewood, the following equipment and materials are used in addition to the linear measures listed above:

- Binding Straps - **Straps with ratchet type closures are easily tightened to secure the wood tightly.** The binding straps are used to hold wood bundles together if the bundles need to be removed from the package/wrapping material.

- ~~**Tracing Paper**~~

- ~~**Graduated template in square centimeters or square inches**~~

- **Graph Paper - 279.4 mm × 431.8 mm (11 in × 17 in) with 0.5 centimeter or ¼ inch squares. This paper is used for tracing and calculating the areas of the ends of a bundle of firewood. Prior to using any graph paper use a calibrated ruler to verify the dimensions of squares at several random points across the page.**

- **Ruler – 300 mm (12 in) with 0.5 cm ($\frac{1}{4}$ in) graduations. This ruler is used with the graph paper to calculate the area of the bundle ends.**

(Amended 2016)

3.14.2. Test Procedures

General Instructions

- **When testing packaged firewood follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.**

- **Measurements shall be read to the smallest graduation on the ruler or tape. Round any value that falls between two graduations up to the higher value except when making headspace depth measurements in the test procedure for boxes where a value falling between two graduations is rounded down.**

- **Samples for Length – Use Table 1. "Minimum Number of Pieces to be Measured for Length" to determine the minimum number of pieces to measure to determine the average length of the firewood pieces in a package or stack.**

Table 1. Minimum Number of Pieces to be Measured for Length		
	Volume	
1.	Packaged Firewood 453 L (16 cu ft) [1/8 cord] or less	Minimum Number of Pieces to be Measured for Length*
a.	For packages with 12 pieces or less	All
b.	For packages with 13 to 50 pieces	At least 12 pieces
c.	For packages with more than 50 pieces	At least 24 pieces
2.	Stacked wood	At least 12 pieces for each ½ cord or fraction thereof
*Note: While the packages of firewood to be included in the sample must be selected using the random sampling techniques described in NIST HB133, Section 2.3.4. "Random Sample Selection" those techniques are not used in selecting the individual pieces for measurement of length. Since the packages were selected at random the assumption is made that the length of any piece selected for measuring is generally representative of the other pieces that the packer cut or selected for inclusion in the package under inspection. When selecting pieces of wood for measurement, take them from different locations in the package or stack so they are representative of the total amount of wood under test.		

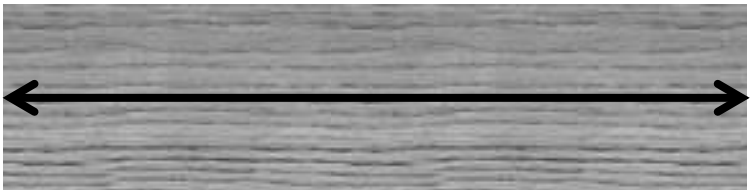
- **Measuring Procedures for Length – Use the instructions and graphics in Table 2. "Determining Piece Length" when measuring the length of pieces to determine the average length of a piece of firewood based on its shape in a package or stack. If a piece of wood does not appear to fall within the examples shown, measure it as if it were an irregular shape and take three or more measurements and average them.**

Table 2.
Determining Piece Length

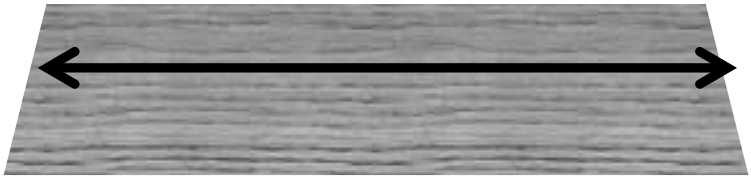
(a) Uniform Shapes

Errors in the length measurement can result in a significant volume errors especially with the small quantities typical of packaged wood. When the pieces are generally cut in a uniform manner, a single measurement along the center line of the logitudinal axis is used to determine piece length. Take the measurement along a straight line between two points over solid wood.

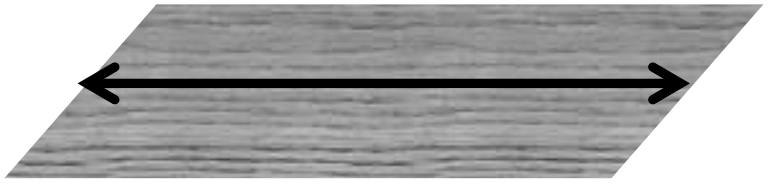
(i) Most wood pieces are cut perpendicular to their longitudinal axis so one measurement taken from the face of one end to the face of the other end will provide an accurate length determination.



(ii) On pieces of wood with "reverse bias" and "bias" end cuts estimate where the center line of the piece is and then measure to these points as shown below. The intent of this measurement is to determine an "average" length that is assumed to fall along the center line of the piece. The top piece is an example of a "reverse" bias cut.



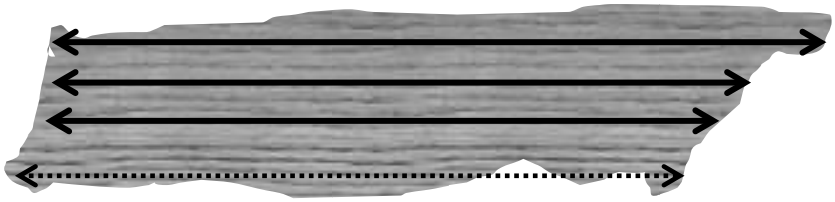
The bottom piece is an example of a bias cut



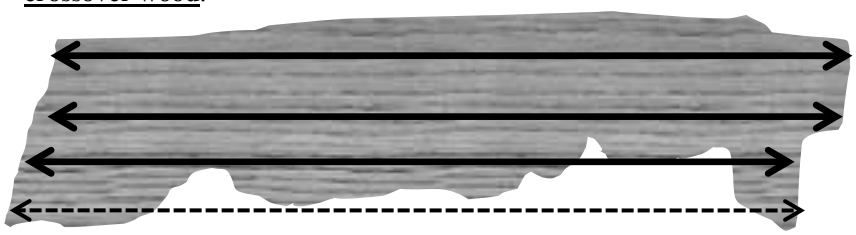
(b) Irregular Shapes

When the pieces have irregular shapes, cuts, or shattered ends, it is necessary to take at least three measurements and average the results to obtain the length of the piece. Take the measurements along a straight line between two points which cover solid wood that appear to be the shortest and longest dimensions and a third measurement at or near the center line of the piece.

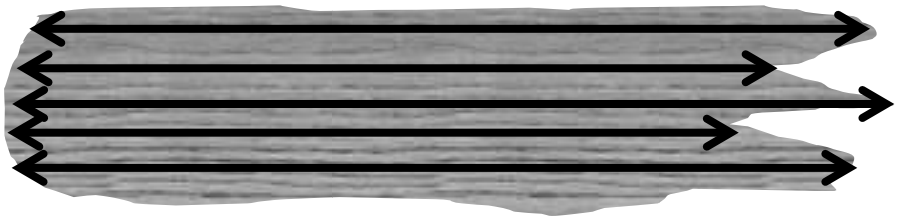
(iii) This is piece has a bias cut end on the left and an irregular end on the right. The measurements are taken at at the longest and shortest points where the line crosses over solid wood. The lowest measurement (dotted line over the air space) is not used because it does not cross wood. Only the three upper measurements are used to calculate the average length for this piece unless additional measurements across solid wood are taken.



(iv) This is a piece with a bias cut on the left and irregular end on the right. Note how the measurements are taken at the longest and shortest points where the line crosses over solid wood. The lowest measurement (the dotted line) would not be used because it does not crossover wood.



(v) This piece of wood has a "shattered end." Shattering occurs when wood is stressed beyond its breaking point and the end is not trimmed. The inspector will take additional measurements to account at the shortest point of the voids and longest points at the extensions. In this example, five measurements were taken and averaged to account for the voids and extensions.



a. Boxed Firewood

Note: A packer may place wrapped bundles of firewood in boxes for ease of handling as well as for display on retail store shelves. When a box contains a bundle of wrapped firewood, the volume of the bundle is verified using the test procedure in c. for bundles and bags.

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.
2. Open the box to determine the average height of the **stack of** wood.
3. Measure the internal height of the box **[See Figure 1. Measuring Internal Height of Box]**

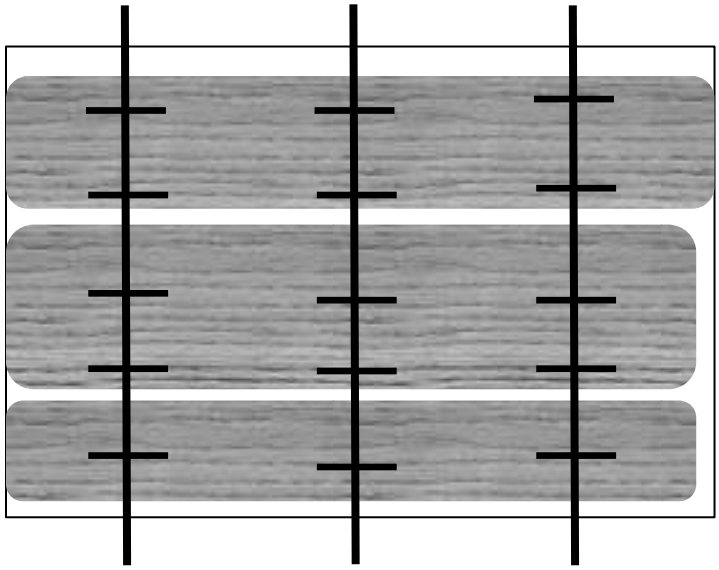
Figure 1 – Measuring Internal Height of Box

4. **Determining the Height of the Wood – Take at least five measurements spaced at intervals along each end and center of the wood stack (record as "d_1, d_2. . .etc. Take at least 15 measurements). [See Figure 2.-Top View of Box – Measure at cross bars and Figure 2.a. – Examples of the Headspace Measurement.] Measure from the bottom of a straightedge placed across the top of the box to the highest point on the wood (round the measurements down to the nearest 0.5 cm [$^1/_8$ in] or less). Calculate the average height of the stack by averaging these measurements and subtracting the result from the internal height of the box using the following formula:**

Average Height of Wood Stack =

(Internal Height of Box) − (Sum of Depth Measurements ÷ Number of Measurements)

Figure 2. Top View of Box – Measure at cross bars.



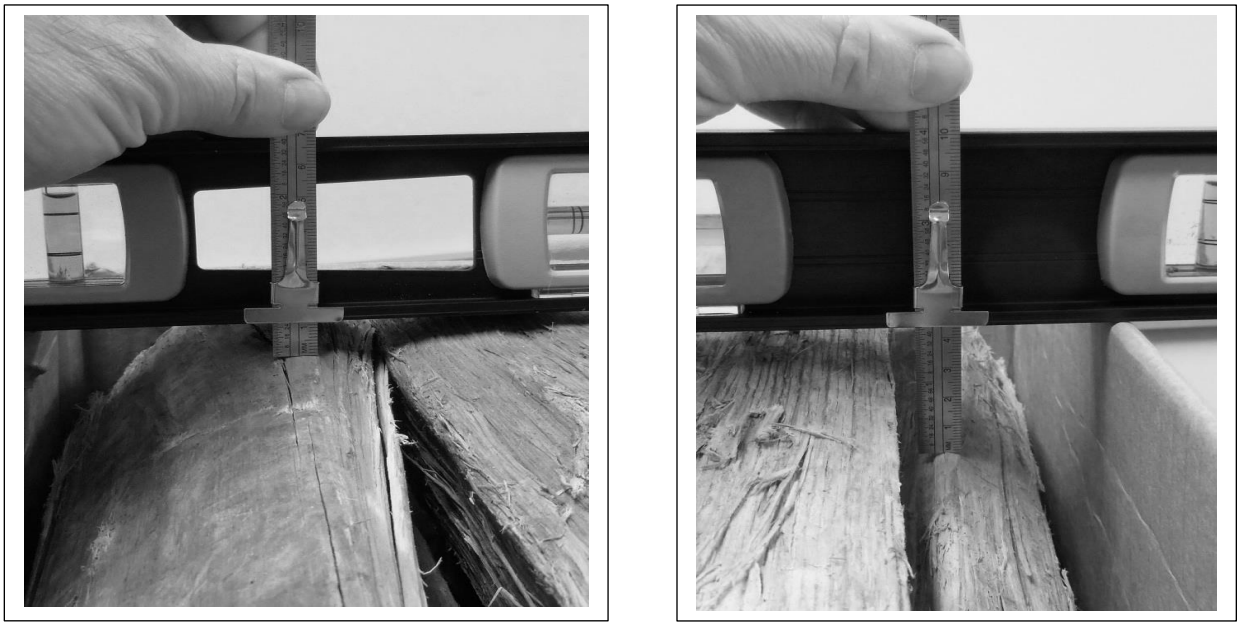


Figure 2.a. – Examples of the Headspace Measurement

~~3~~5. **Width of Wood Stack - Open the box and measure the width of the wood stack. Take at least five measurements at intervals spaced along the length of the stack. Average these values to obtain an Average Width of Wood Stack. [See Figure 3. – Top View of Box – Measure at crosslines and Figure 3.a. – Measuring the Width of the Firewood in a Box] You are measuring the width of the wood, not the width of the box. ~~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.~~**

~~*Average Width = $(W_1 + W_2 + W_3) \div (3)$*~~

Average Width of Wood Stack = $(W_1 + W_2 + W_3 + W_4 + W_5) \div 5$

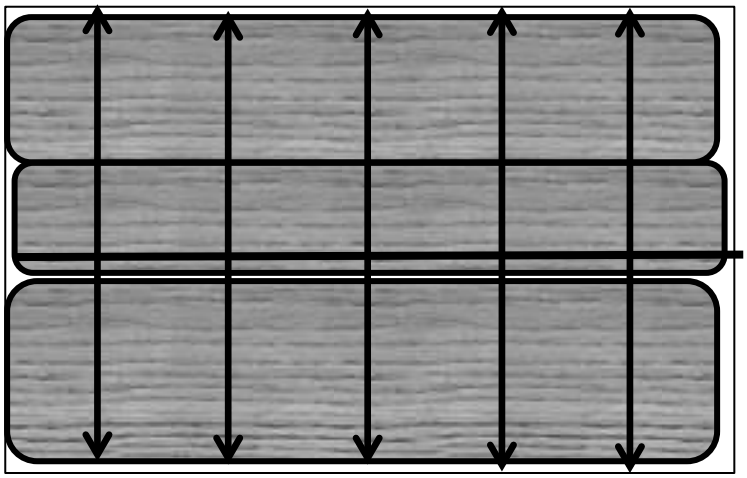


Figure 3. Top View of Box – Measure at crosslines.

Figure 3.a. – Measuring the Width of the Firewood in a Box

~~8~~6. Individual Piece Length – **~~To determine the average length of the piece of wood~~**, Remove the wood from the **package and measure the length of each piece of wood (see Table 1. "Minimum Number of Pieces to be Measured for Length." If the piece of wood is uniform in shape take at least 1 point-to-point measurement along the center line of the longitudinal axis (see Table 2. "Determining Piece Length – (a) Uniform Shapes" for examples) and record the value. ~~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.~~**

~~Average Length = $(L_1 + L_2 + L_3 + L_4 + L_5) \div (5)$~~

If the wood is irregularly shaped (see Table 2. "Determining Piece Length – (b) Irregular Shapes" for examples) take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a third at or near the center-line of the piece. Calculate the average of the measurements to obtain the Average Individual Piece Length and record the length of the piece.

To determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:

AIPL = (L_1 + L_2 + L_3) ÷ 3

After all pieces are measured, total the lengths and divide that total by the number of samples to obtain the Average Piece Length for the package.

To determine Average Piece Length (APL) for the package:

APL = (L_1 + L_2 + L_3 + L_n) ÷ (Number of Pieces in Sample)

~~6~~.**7. Use the average values for height, width, and length to** calculate the volume of wood ~~**within**~~ in the box.

*Volume in liters = (height in **mm** ~~**cm**~~ × width in ~~**mm cm**~~ × length in **mm** ~~**cm**~~) ÷ **1,000,000** ~~**(1000)**~~*

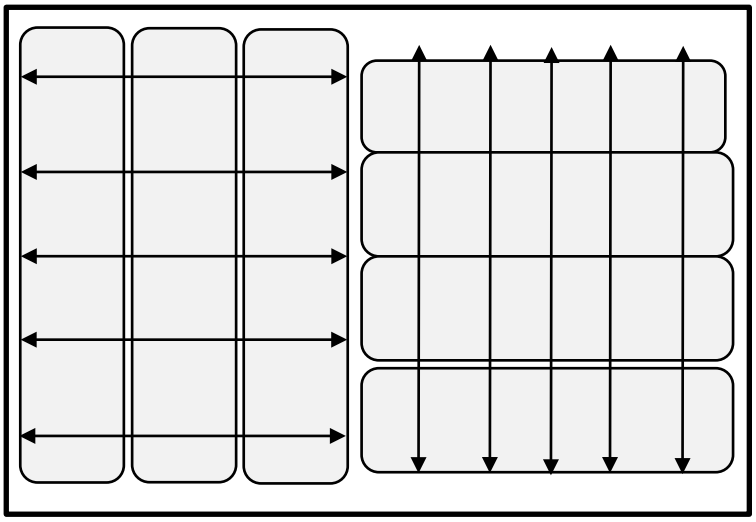
Volume in cubic feet = (height in inches × width in inches × length in inches) ÷ (1728)

Note: 1 Cubic Foot = 1728 in^3, 1 Cubic Liter – 1,000,000 L^3

~~7.~~**8.** 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. Compute total volume by adding Volume 1 (V_1) and Volume 2 (V_2) according to the following formula.

Total Volume = V_1 + V_2

This illustration shows how the width of the firewood is measured when two perpendicular stacks of firewood are in a box. The height, width and length of the pieces are used to determine the volume of the separate stacks which are then added together to obtain the volume of wood in the package.



Volume 1 **Volume 2**

b. ~~Crosshatched~~ Stacked Firewood

Bulk deliveries of firewood are typically required by law or regulation to be on the basis of Cord measurement. The "Cord" is defined as the amount of wood contained in a space of 128 cubic feet when the wood is ranked and well stowed. The standard dimensions for a Cord of wood are

4 ft × 4 ft × 8 ft but wood may be stacked and measured any configuration. See Figure 4. for an illustration of how a Cord may be stacked.

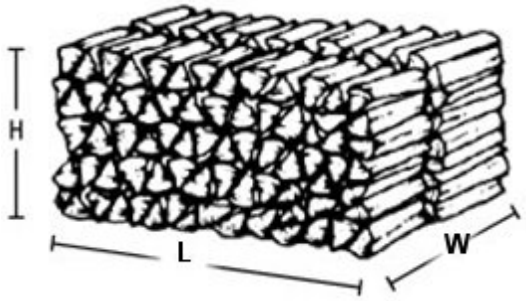


Figure 4. A Cord - 4 ft (Height) × 4 ft (Width) × 8 ft (Length)

~~**1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.**~~

~~**2. Stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular).**~~

~~**3. Determine the average measurements of the stack:**~~

~~**Note: The number of measurements for each dimension given below is the minimum that should be taken.**~~

- ~~**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.**~~

1. **Wood delivered to a consumer: if a delivery ticket or sales receipt is available (these are often required by state regulation) review the delivery ticket or sales receipt and determine the quantity delivered. Identify the wood to be measured and verify that the wood delivered was not mixed with wood that was already present at the location. Also, determine if the delivery was partial or complete (i.e., no additional deliveries are expected) and if any of the delivered wood has been used.**

   If necessary stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular). Any voids that will accommodate a piece of wood in the stack shall be deducted from the measured volume.

Note: The length measurements of the individual pieces may be made during the stacking process.

2. **Determine the average measurements of the stack: the number of measurements for each dimension given below is the minimum that should be taken.**

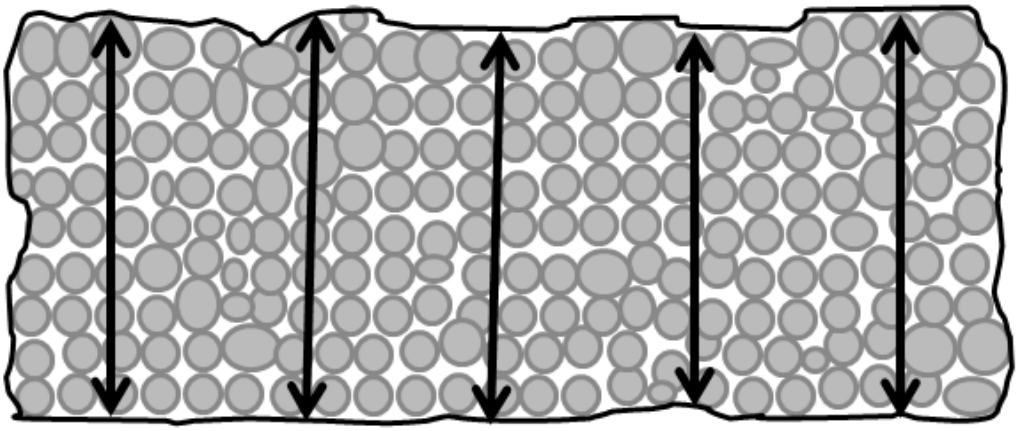
   - **Height of Stack: A height measurement is the vertical distance between the top edge of a piece of wood in the top row and the bottom edge of a piece of wood on the bottom row. Start at one end of the front of the stack; measure the height of the stack at five equally spaced intervals**

(e.g., approximately 18 to 24 in) along the length of stack. If the length of the stack is over 10 ft take additional height measurements at equally spaced intervals along its length. If the height of the stack varies significantly (e.g., the pieces are stacked in peaks along the length of the stack) take additional height measurements. Calculate and record the average height for the front of the stack. Repeat the same height measurement procedure along the back of the stack and then calculate and record the average height for the back of the stack. Calculate the average height of the stack by averaging the two results. If the wood to be measured is stacked on a slope, take the height measurements at right-angles to the slope.

$$\textit{Average Height}_{Front} = (h_1 + h_2 + h_3 + h_4 + h_5) \div 5$$

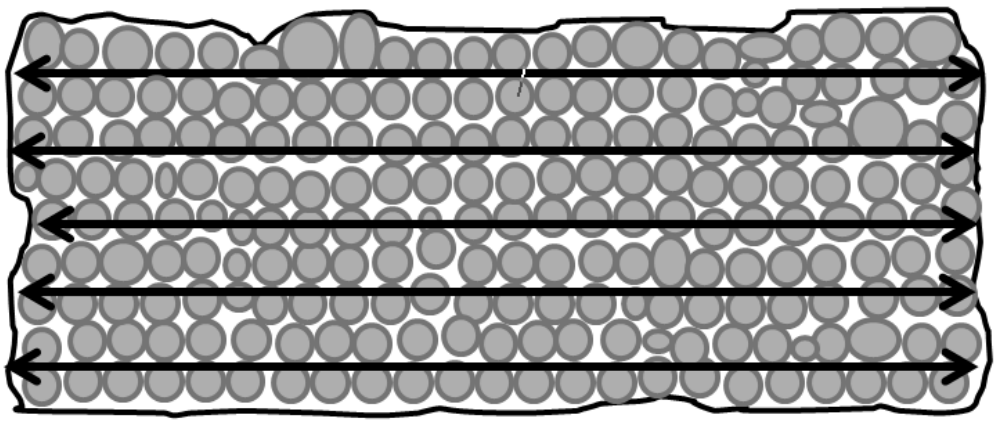
$$\textit{Average Height}_{Back} = (h_1 + h_2 + h_3 + h_4 + h_5) \div 5$$

$$\textit{Average Height of Stack} = \textit{Average Height}_{Front} + \textit{Average Height}_{Back} \div 2$$



Average Height Measurement (front and back)

- **Length of Stack: A length measurement is the horizontal distance between the left edge of a piece of wood on the left side of the stack and the right edge of a piece of wood on the opposite side of the stack. Start at either side of the stack; Measure the length of the stack in five equal intervals. Calculate and record the average length. If the length of the stack varies significantly (e.g., the ends of the stack bulge out along the height of the stack) take additional measurements.**



Average Length Measurement (front and back)

- **Calculate and record the average length for the front of the stack. Repeat the length measurement procedure along the back of the stack and then calculate and record the average length for the stack.**

$$Average\ Stack\ Length_{Front} = (l_1 + l_2 + l_3 + l_4 + l_5) \div 5$$

$$Average\ Stack\ Length_{Back} = (l_1 + l_2 + l_3 + l_4 + l_5) \div 5$$

$$Average\ Stack\ Length = (Average\ Length_{Front} + Average\ Length_{Back}) \div 2$$

- **Stack Width is Equal to the Average Length of Pieces that Make up the Width of the Stack – Refer to Table 1. "Minimum Number of Pieces to be Measured for Length" to determine how many pieces are to be measured. This dimension is calculated by averaging the length of individual pieces of wood in the stack. The wood can be stacked in a single or multiple rows. If the wood is stacked in several rows deep select a representative random sample from each row. If the wood needs to be stacked, measure the pieces prior to stacking. If the wood is already stacked, select the pieces at random by moving up and down and across the stack. If it is necessary to remove the wood from a stack to measure the individual piece lengths, always complete the height and length measurements before disturbing the stacked wood.**

3. **Individual Piece Length - Table 1. "Minimum Number of Pieces to be Measured for Length" requires that at least 12 pieces of wood be measured for every ½ cord estimated to be in the stack.**

   - **If the wood is uniform in shape take at least 1 point-to-point measurement along the center line of the longitudinal axis (see Table 2. "Determining Piece Length – (a) Uniform Shape" for examples) and record the value.**

   - **If the wood is irregularly shaped (see Table 2. "Determining Piece Length – (b) Irregular Shape" for examples) take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a 3rd at or near the center-line of the piece. Calculate the average of the measurements to determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:**

$$AIPL = (L_1 + L_2 + L_3) \div 3$$

   - **After all pieces are measured total the lengths and divide the total by the number of samples to obtain the Average Piece Length for the stack. To determine Average Piece Length (APL) for the package:**

APL = ($L_1 + L_2 + L_3 + \ldots L_n$) ÷ (Number of Pieces in Sample)

4. Calculate Volume:

Volume in liters = (Avg. Height [cm] × Avg. Width [cm] × Average Piece Length [cm]) ÷ 1000

Volume in cubic feet = (Avg. Height [in] × Avg. Width [in] × Average Piece Length [in]) ÷ 1728

5. Supplemental Measurement of Stacked Wood

- **Volume of a Triangle Stack of Wood – To calculate the volume of a triangular stack take at least two measurements (one each side) of the height and length, and five measurements of the width of the stack and average each result. Use this formula to calculate the volume.**

Volume of Triangular Stack = (Avg. Height × Avg. Length of Base × Avg. Width) ÷ 2

- **The volume of the triangular stack may be added to the volume of other stacks.**

Figure 5. Triangular Stack

~~c.~~ Bundles and Bags ~~of firewood~~

Figure 6. Firewood Bundle (left) and Bag (right)

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

Test Note: To test a bag of firewood remove the wood from the bag and form a compact bundle and strap it as shown in Figure 7 and follow the procedures for measuring a bundle.

2. Average Area of **Bundle** 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**~~

   - **Place a binding strap around each end of the bundle (or bag of wood) to prevent movement of the pieces during test. Place the straps approximately 10 cm (4 in) from the ends (See Figure 7 "Bundle with Straps" placed in 10 cm [4 in]) and tighten them securely.**

Figure 7. Bundle with Straps placed 10 cm (4 in).

Notice: Do not use shrink wrap or packaging to define the perimeter because it can result in inaccurate measurements. If necessary, trim the shrink wrap back from the ends to allow for the bundle to sit flat on the graph paper.

   - **Set one end of the bundle or bag on graph paper large enough to cover the end completely. Draw a line around the outside of the wood perimeter on the graph paper using a sharp point marking pen (see Figure 8. Tracing Perimeter of the Wood).**

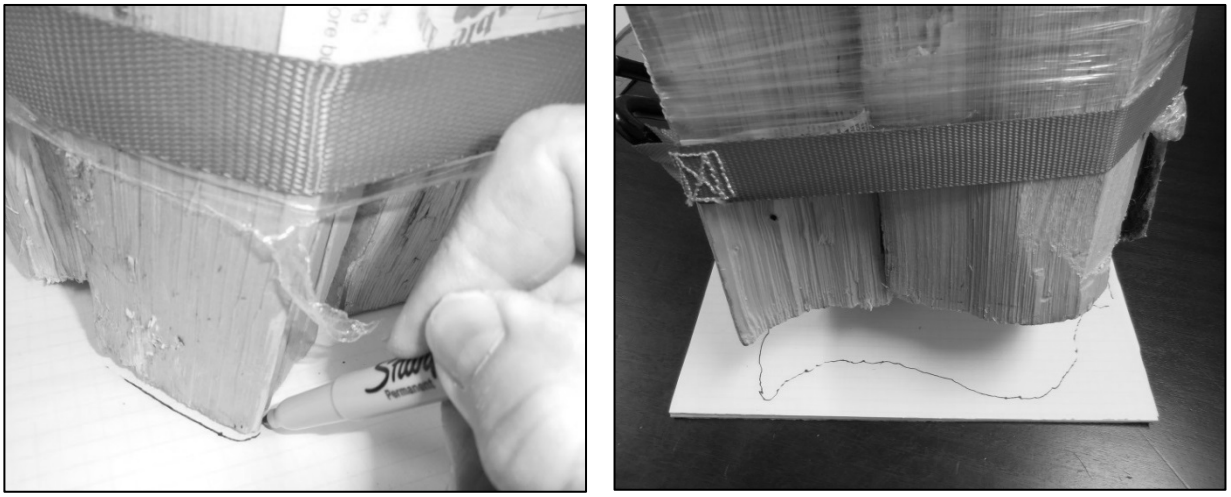


Figure 8. Tracing the Perimeter of the Wood.

- **Count the number of square centimeters or square inches that are enclosed within the perimeter line. Determine portions of square centimeters or square inches not completely within the perimeter line to the nearest one-quarter square inch. Repeat this process on the opposite end of the bundle or bag.**

Examples:

(1) Using ¼ square inch graph paper and a ruler with ¼ inch graduations, large blocks of the area within the perimeter are quickly measured. This is done by using the ruler to determine the length and then width of the area which are each divided by 0.25 (¼ in) {or multiply 4 × 7.25} to obtain the number of blocks in that dimension. These two values are multiplied to obtain the total number of blocks enclosed in the area. The areas in the partially covered blocks are rounded up or down to the nearest ¼ inch by enclosing the whole square and placing an x in the partial spaces which are included in the blocks where the area has been rounded up. One reason for squaring the graph squares is to simplify the counting.

(2) Use a ruler to count graph squares: the rulers in Figure 9. "Perimeter of a Bundle Defined by the Wood" indicate the dimensions of the square are $7\frac{1}{4} \times 7\frac{3}{4}$ in. To obtain the number of blocks divide 7.25 by 0.25 {or multiply 4 × 7.25}. to obtain the number of blocks along the left hand line (7.25 ÷ 0.25 = 29.) The bottom line measures $7\frac{3}{4}$ in so 7.75 ÷ 0.25 = 31 {or 4 × 7.75 = 31}. Multiple the two values to obtain the total number of squares within the area which is: 29 × 31 = 899. To obtain square inches divide 899 by 16 (the number of ¼ inch graph squares in a square inch) or 899 ÷ 16 = for area of 56.19 in^2 for this area of the bundle.

(3) Continue to divide the area into blocks to make counting easier and then count the blocks in the remaining areas and sum these values to obtain the total. See the example in Figure 9. "Perimeter of a Bundle of Defined by the Wood." The total number of blocks was calculated by adding: 46 + 145 + 899 + 25 + 8 + 54 = 1177 squares ÷ 16 = 73.56 square inches for this end of the bundle.

Calculate the Average Area: Average Area = $(Area_1 + Area_2) \div 2$

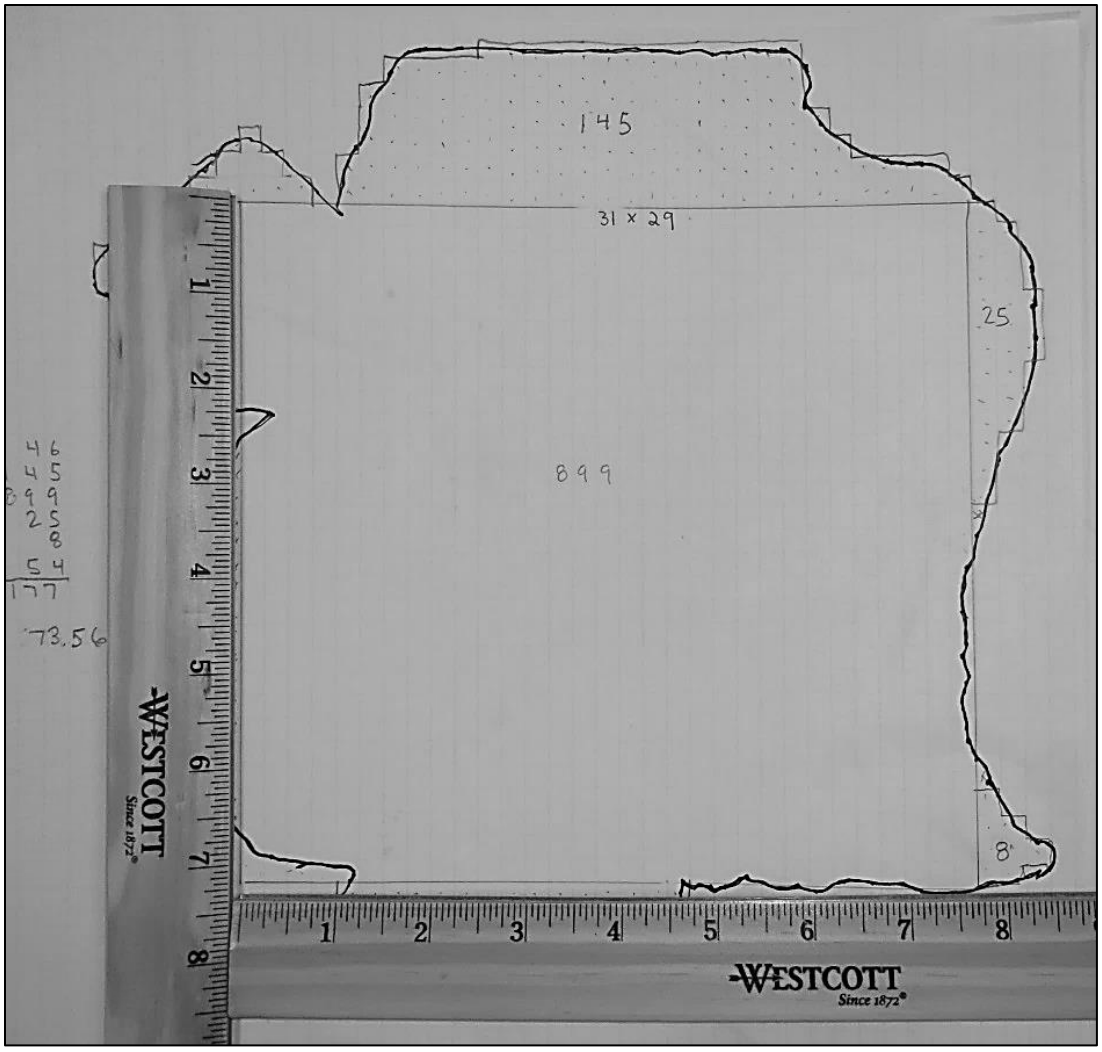


Figure 9. Perimeter of a Bundle Defined by the Wood.

3. Average Length of the Pieces of Wood: ~~**select the five pieces with the greatest girth and measures the length of the pieces. Calculate the average length of the pieces of wood.**~~ **Individual Piece Length - Remove the wood from the package and measure the length of each piece of wood (see Table 1. "Minimum Number of Pieces to be Measured for Length" for the number of pieces to be measured.) If the piece of wood is uniform in shape take at least one point-to-point measurement along the center line of the longitudinal axis (see Table 2. Determining Piece Length - (a) Uniform Shapes for examples) and record the value.**

~~***Average Length = $(L_1 + L_2 + L_3 + L_4 + L_5) \div 5$***~~

- **If the wood is irregularly shaped (see Table 2. Determining Piece Length - (b) Irregular Shapes for examples) take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a t at or near the center-line of the piece. Calculate the average of the measurements to obtain the Average Individual Piece Length and record the length of the piece.**

To determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:

AIPL = $(L_1 + L_2 + L_3) \div 3$

Note: If length measurements are made in millimeters divide the total by 10 to obtain centimeters.

- **After all pieces are measured, total the lengths and divide that total by the number of samples to obtain the Average Piece Length for the package.**

To determine Average Piece Length (APL) for the package:

$$APL = (L_1 + L_2 + L_3 + \ldots L_n) \div (\text{Number of Pieces in Sample})$$

4. Use the average values for height, width, and length to calculate the volume of wood in the bundle or bag.

- Calculate Volume:

$$\text{Volume in liters} = (\text{Average Area } [cm^2] \times \text{Average Length } [cm]) \div 1000$$

$$\text{Volume in cubic feet} = (\text{Average Area } [in^2] \times \text{Average Length } [in]) \div 1728$$

Note: 1 Cubic Foot = 1728 in^3, 1 L^3 = 1000 cm

(Amended 2016)

3.14.3. Evaluation of Results

Follow Section 2.3.7. "Evaluate for Compliance" 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 Stove Wood Labeled by Volume**, and Packages Labeled by Count with 50 Items or Fewer."

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

	Maximum Allowable Variations (MAVs)
Packaged Firewood and Stove Wood Labeled by Volume	**20 % of labeled quantity** **Note: Use Table 2-5 "Maximum Allowable Variations for Packages Labeled by Weight" for packaged artificial and compressed fireplace logs and stove wood pellets and chips labeled by weight.**

Field Audit Procedure

A circumference estimating method can be used for quickly identifying potentially short measure bundles. The procedure is based on measuring the circumference of the package ends and calculating the areas without using graph paper. It shall be used for audit purposes only and must not be used for official inspection.

Circumference Estimating Method

1. After the bundle or bag is secured, use a flexible measuring tape to measure the circumference near each end of the bundle or bag of firewood. Using one movement extend the measuring tape around the end of the bundle or bag to obtain its circumference. The tape must be pulled tight. If the wood at the ends of a bag or bundle is not accessible due to plastic wrapping, then wrapping

should be moved away from the ends so the measuring tape can be placed tightly around the bundle so circumference measurements can be taken.

Figure 13. Strapping the End of a Bundle

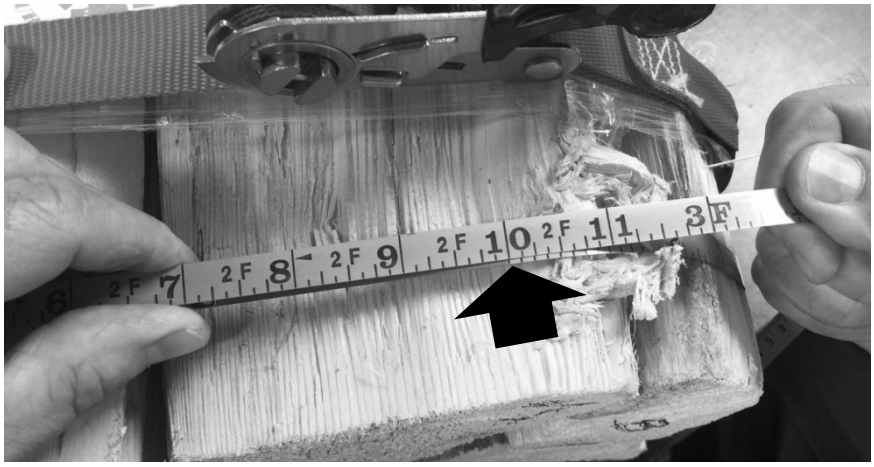


Figure 13a. Measuring the Circumference of the Bundle. At the point of the arrow, the circumference of the bundle is 2 ft 10 in (34 in).

Note: The tape used has a blank end so the "0" line is visible immediately under the 10 in mark.

2. **Calculate the Average Circumference:**

$$\textit{Average Circumference} = (\textit{circumference}_1 + \textit{circumference}_2) \div 2$$

Example:
If $\textit{circumference}_1$ **is** *34 in and* $\textit{circumference}_2$ **is 33.75 in then:**
Average Circumference: 34 + 33.75 ÷ 2 = 33.875 in

3. **Calculate the radius**

$$\textit{Radius} = \textit{Average Circumference} \div 2\pi$$

Where: π = 3.1415

Example:
radius = 33.875 ÷ (2 × π or 6.283) = 5.39 in

4. Calculate the *Average Area*

$$Average\ Area = \pi r^2$$

For example: $Average\ Area = 3.1415 \times 5.39^2\ (or\ 29.06) = 91.3\ in^2$

5. Calculate the Average Length of the Pieces:

Average length of the pieces of wood - Measure the length of several pieces of wood in the bundle or bag. Measurements are to be taken from center to center at the end of each piece.

Then calculate the average:

Average length = sum of the length of all pieces ÷ number of pieces

6. Calculate Volume:

$$Volume\ in\ liters = (Average\ area\ [cm^2] \times Average\ Length\ [cm]) \div 1000$$

$$Volume\ in\ cubic\ feet = (Average\ Area\ [in^2] \times Average\ Length\ [in]) \div 1728$$

Example:
Assume the Average Length of the Pieces is 16 in and Average Area is 91.3 in^2

$$Bundle\ Volume = 91.3\ in^2 \times 16\ in = 1460\ in^3\ or\ 0.84\ ft^3$$

If results indicate that the sample fails conduct further testing using the reference test procedure for bundles and bags. Do not take any legal action based solely on this audit procedure.

Note: The implementation date for this is effective July 1, 2017.

(Amended 2016)

Background/Discussion:
Recent inspections of packaged firewood by weights and measures officials in different states have uncovered a lack of uniformity in the procedures used to test bundles, boxes and bags of packaged firewood. Section 3.14. Firewood, of NIST Handbook 133 is written ambiguously such that if the same bundle of firewood were tested by different states, the test results would be substantially different. The problems described below were uncovered through limited testing and research. However, after reviewing the test data it is apparent there is a need to clarify the procedures and improve the accuracy of the measurement procedures so that the volume of wood in bags, bundles, boxes and stacks are determined accurately and consistently (refer to the 2015 Executive Summary Information). Improving the test procedures will help ensure that consumers can make value comparisons and reduce unfair competition. The current procedure for measuring the length of the pieces of wood, regardless of whether it is offered for sale in a box, bag, bundle or stack requires that only one measurement be taken on a piece of wood along its centerline. While one measurement may be adequate for uniformly cut pieces, it is not suitable for use with non-uniform pieces such as those with irregular cuts. The proposal includes new procedures that allow for averaging multiple measurements to improve the accuracy of length determinations. Another concern with the current test method is that it only requires that five pieces with the largest girth be measured in any package or stack to determine an average length, which can lead to significant differences between the average length of those pieces as compared to the average length obtained when most or all the pieces are measured. The proposal includes a recommendation to increase the number of pieces measured to increase the accuracy of length determinations in the test procedures for bags, boxes, bundles and stacks

of firewood. In addition to the proposals aimed at improving length determinations, suggested changes to the test procedures for boxed firewood are proposed to clarify how to measure the amount of firewood and this includes taking additional measures to improve the accuracy of the average measurements of height and width of the stack of wood that the box contains. To improve the testing procedures for bags and bundles, the proposal includes a recommendation to use grid paper with a finer resolution. Several photographs have been added to better illustrate how the wood is to be secured for measurement. One significant issue which the proposal asks the NCWM to resolve is how the perimeter of the bundle is to be defined for use in determining the areas of each end. This issue arose because several states interpret the current procedure as requiring that the perimeter of the bundle be defined by the wood, while at least one state interprets the procedure as requiring that the perimeter be defined by a strap or tape affixed at the extreme ends of the bundles. When the areas of the bundle ends are determined using the wood to define the perimeter, the volume of a bundle is less than if the volume of the bundle is determined using a strap define the perimeters. The proposal also includes a recommendation that the NCWM amend NIST Handbook 133 to apply a Maximum Allowable Variation (MAV) to packaged firewood so that the sale of unreasonably short-measure bags, bundles and boxes can be prohibited. In addition to these proposed revisions, suggested improvements to the test procedures for determining the volume of stacked firewood are also included. Finally, an audit test procedure for use with bundles and bags (which uses a circumference measurement as the means to determine the volume) was recommended by a major packer of firewood. Preliminary testing has shown that it could be developed for use in the field to conduct quick audits to determine if a sample should be tested using the more accurate procedures that are needed for accurate determination.

At the 2016 NCWM Interim Meeting, comments were taken for this item and Item 260-4. Mr. Kurt Floren (Los Angeles County, California) recommended that the option 2 within the proposal proceed as a Voting item. Mr. Floren also remarked that he felt that the 25 % MAV for this proposal was extreme. The NIST Technical Advisor clarified that based upon the limited test data, having no limit on minus errors does not appear to be reasonable. The 25 % is a recommended MAV to be adopted for the limit on minus errors pending further study unless packers can provide an alternative number. It was also derived based on what a reasonable consumer would consider an unreasonable minus error. Mr. Floren then concurred with the MAV findings, but also wanted the math calculations (page 45) to be reviewed for accuracy. The NIST Technical Advisor reviewed the math, and this can either be divided or multiply the calculations, and you will have the same results. The Committee reviewed the two different approaches in the proposal and selected approach two to move forward. The Item under Consideration in NCWM Publication 16 (2016) will have the formatting (bold underline/underscore) and will only reflect the test procedure with approach two language.

At the NCWM Annual Meeting, comment was made stating the MAV was too high. The Committee recommended that the MAV be 20 % and evaluated once additional data is available for review. The NIST Technical Advisor recommended a six-month extension on the implementation date (amend to July 1, 2017); if this passes, to allow the industry to change its methods and procedures to ensure they meet the volume statement and correct labels based on the new test procedures. This item was voted on and adopted as a Consent Calendar item.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, an industry representative expressed supported for the NIST proposal for measuring the actual perimeter of the wood. Another representative stated that air space is allowed in the testing of cords. Several officials expressed concern that a 25 % MAV was excessive. WWMA requested that NIST determine the variance in results using the methods in approaches one and two. A more thorough analysis of other feasible test methods such as water displacement and laser measuring devices be studied as well for an understanding of measuring accuracy. They also requested that NIST work with industry to define a more appropriate MAV. WWMA does not have a recommendation regarding requested input by NIST on chunks and split wood for flavoring and smoking, and recommends obtaining additional input from industry. WWMA forwarded the item to NCWM, recommending that if be an Informational item.

At the 2015 CWMA Interim Meeting, there were no comments heard. The Committee did not have adequate information regarding comparisons between new Item 3 and new Item 4 on their agenda. Consequently, CWMA forwarded the item to NCWM and recommended that it be an Informational item.

At the 2015 NEWMA Interim Meetings, the Committee reached consensus that the region does not have enough information and recommends that this be an Informational item.

At the 2015 SWMA Annual the NIST Technical Advisor provided an overview of this test procedure. The SWMA believes that the NIST proposal is a more accurate method of testing the quantity of packaged firewood rather than the procedure proposed in Item 260-4. NIST did incorporate a portion of Item 260-4 as an audit test. The SWMA agrees with this proposal and recommends "Approach 1-Tape Defines the Perimeter" since it provides accuracy in addition to efficiency for the inspector. SWMA forwarded the item to NCWM and recommended that it be a Voting item.

At the 2016 NEWMA Annual Meeting, a Connecticut weights and measures inspector opposed this item due to the cumbersome test procedure. The NIST Technical Advisor commented that in NIST Handbook 133 there are several procedures that are lengthy, but we need to obtain accurate results. NEWMA considers this item to be fully developed and supports it as a Voting item.

At the 2016 CWMA Annual Meeting, there were no comments heard during open hearings. CWMA considers this item to be fully developed and supports it as a Voting item.

260-4 W Section 3.14. Firewood – Volumetric Test Procedures for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less) and Stacked Firewood sold by the Cord or fractions of a Cord. (See Related Items 232-4 and 260-3)

(This item was Withdrawn.)

Source:
California HotWood, Inc. (2016)

Purpose:
To provide a more uniform and concise method for measuring packaged firewood, an inherently irregular and challenging material to measure, and to clarify existing procedures.

Item under Consideration:
Amend the NIST Handbook 133 as follows:

3.14. Firewood –Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less)

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.

3.14.1. ~~**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.**~~
- ~~**Tracing paper**~~
- ~~**Graduated template in square centimeters or square inches**~~

Test equipment needed:

A. Boxed Firewood

1. **Straight Edge**
2. **Linear Tape Measure**

B. Crosshatched Firewood

1. Measuring Tape

C. BUNDLES AND BAGS OF FIREWOOD

1. Binding Straps – Two binding straps, 1 to 2 inches wide with connecting buckles and long enough to easily encircle the Bundle or Bag to secure the wood during testing.

2. Flexible Measuring Tape

3.14.2. Test Procedures

a. Boxed Firewood

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

Open the box and if the box contains a bundle or bag of firewood remove the bundle or bag and calculate the volume in accordance with Section C (Bundles and Bags of Firewood).

2. 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.

$$\textit{Average Height of Stack} = \textit{(Internal Height of Box)} - \textit{(sum of measurements)} \div \textit{(number of measurements)}$$

3. 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.

$$\textit{Average Width} = (W_1 + W_2 + W_3) \div (3)$$

4. 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.

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div (5)$$

5. Calculate the volume of the wood within the box. Use dimensions for height, width, and length.

$$\textit{Volume in liters} = (\textit{height in cm} \times \textit{width in cm} \times \textit{length in cm}) \div (1000)$$

$$\textit{Volume in cubic feet} = (\textit{height in inches} \times \textit{width in inches} \times \textit{length in inches}) \div (1728)$$

6. 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 VR_1 and V_2. Compute total volume by adding Volume 1 (V_1) and Volume ($V_{2)}$ according to the following formula.

$$Total\ Volume = V_1 + V_2$$

b. Crosshatched Firewood

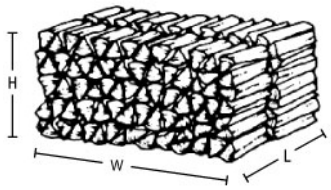


Figure 3-3. Stacked Firewood

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. Stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular).

3. Determine the average measurements of the stack:

Note: The number of measurements for each dimension given below is the minimum that should be taken.

- 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.

4. Calculate Volume.

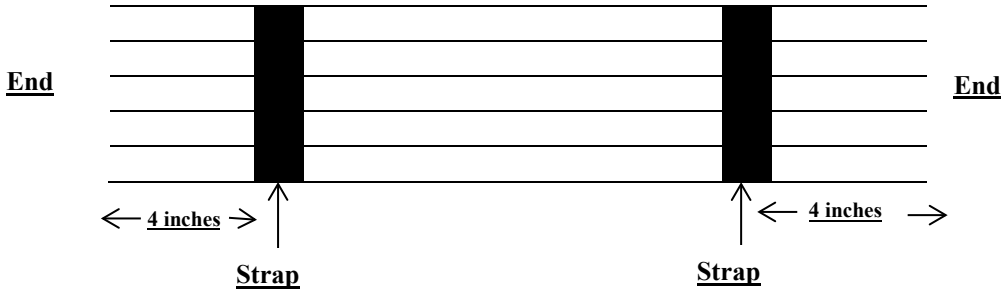
Volume in liters = (Avg. Height [cm] × Avg. Width [cm] × Avg. Length in [cm]) ÷ 1000

Volume in cubic feet = (Avg. Height [in] × Avg. Width [in] × Avg. Length [in]) ÷ 1728

c. Bundles and Bags of Firewood

Figure 3-4. Bundle of Firewood

- Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.
- 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**~~. **Each strap is to be placed approximately 4 inches from each end of the Bundle or Bag. See Diagram.**



- ~~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.~~

- ~~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.~~

- ~~Repeat this process on the opposite end of the bundle or bag.~~

- ~~Calculate the Average Area:~~

$$\textit{Average Area} = (\textit{Area 1} + \textit{Area 2}) \div 2$$

- ~~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:~~

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

- ~~Calculate Volume:~~

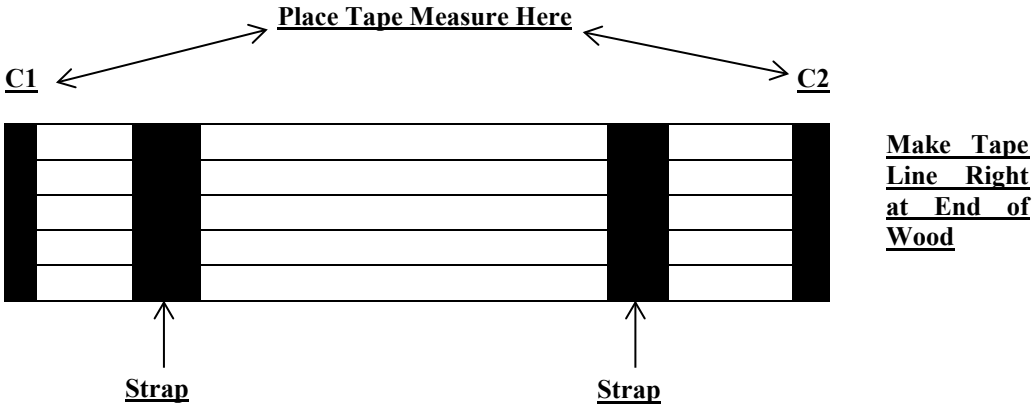
$$\textit{Volume in liters} = (\textit{Average Area } [cm^2] \times \textit{Average Length } [cm]) \div 1000$$

$$\textit{Volume in cubic feet} = (\textit{Average Area } [in^2] \times \textit{Average Length } [in]) \div 1728$$

~~3.14.3. Evaluation of Results~~

~~Follow Section 2.3.7. "Evaluate for Compliance to determine lot conformance.~~

After the Bundle or Bag is secured and utilizing a flexible measuring tape, measure around each end of the bundle or bag of firewood with one movement by extending the measuring tape around the entire end of the bundle or bag in order to obtain a circumference. If the wood at the ends of a bag or bundle is not accessible due to plastic wrapping, then the flexible measuring tape is placed tightly around the outside of the plastic wrapping and circumference measurements are taken. See Diagram:



- **Calculate the average Circumference**

  Average Circumference = (circumference1 + circumference2) /2

- **Calculate the Average Area using the average circumference (from above)**

  $$AREA = \pi R^2$$

  $$R = C/2\pi$$

  $$\pi = 3.1415$$

- **Calculate the Average Length**

  Average length of the pieces of wood - Measure the length of each piece of wood in the bundle or bag. Measurements are to be taken from center to center at the end of each piece. Then calculate their average: Average length = sum of all pieces/ number of pieces.

- **Calculate Volume:**

  Volume in liters = (Average area [cm²] × Average Length [cm]) / 1000

  Volume in cubic feet = (Average Area [in²] × Average Length) / 1728

Background/Discussion:
This proposal is intended to clarify the existing method of measurement, reduce the risk of varied interpretations, and concisely describe the method for measuring packaged firewood.

Historically, the measurement of firewood, whether in a box, a bundle, or a cord, has been a challenge due to the inherent irregularity of firewood, and the unavoidable airspace in the product. One method was examined in 1991 in litigation against the California Department of Food and Agriculture (responsible for weights and measures). The volumetric test procedure for measuring firewood in containers was found by the court to be unconstitutionally vague and ambiguous. Owing to the need to develop a new methodology, the California Department of Food and Agriculture met with representatives of the California firewood industry, including California HotWood, to establish a standardized method of measurement for firewood, including the measuring procedures for bundled firewood. Various methods were extensively explored and studied, and a new method was developed satisfactory to the California Department of Food and Agriculture and the industry, including California HotWood. The method was subject to repetition without appreciable variation by the industry and by enforcement. The standard adopted by California in 1995 was later adopted by NIST, and has been functioning for some 20 years. Recently questions surfaced regarding the procedure, and the proposed methodology is to resolve those questions.

At the 2016 NCWM Interim Meeting, comments were taken for this item and Item 260-3. The Committee heard support for Item 260-3. The Committee recommended this be Withdrawn.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, the Committee believed the area calculation suggested is not appropriate for firewood bundling. Errors can be introduced using a circumference measure because the formula is intended for a circle or cylinder. Therefore, the WWMA did not forward this item to NCWM.

At the 2015 CWMA Interim Meeting it was reported that multiple state regulators were curious to hear more about this proposal, as well as the related NIST proposal and how the two proposals differ. One regulator recommended the item remain Informational until more information can be presented to the CWMA. The CWMA forwarded the item to NCWM and recommended that it be an Informational item due to a lack of information.

At the 2015 NEWMA Interim Meeting, there were no comments or support of this item. NEWMA is recommending this item be Withdrawn.

At the 2015 SWMA Annual Meeting, the Committee did not forward this item to NCWM and recommended that this item it be Withdrawn. The SWMA supported the advancement of Item 260-3 and the inclusion of the audit procedure that incorporates the Hot Wood proposal.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

260-5 V Section 3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages of Animal Bedding

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2015)

Purpose:
Add a test procedure in NIST Handbook 133, Section 3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages on Animal Bedding. This test procedure will be used for verifying the compressed volume and usable (uncompressed) volume on packages of animal bedding.

Item under Consideration:
Amend NIST Han

3.15. Test Procedure for Verifying the Usable Volume Declaration on Packages of Animal Bedding

3.15.1. Test Equipment

- **Calculator or spreadsheet software**
- **Modified Standard Package Report Form for Animal Bedding**
- **Package Inspection Worksheet Appropriate for Test Measure:**

  - **9-Point Measurement Grid and Package Error Worksheet for Cylindrical, Square or Rectangular Test Measures**

- **Permanent ink marking pen.**
- **Knife or razor cutter (for use in opening packages and unwrapping shrink-wrapped pallets in warehouses)**
- **Cellophane Tape, Duct Tape (for repairing chutes and sealing packages)**
- **Polyethylene Bags (49 L to 113.5 L [13 gal to 30 gal]) (to hold product once it is uncompressed)**
- **Rigid Rulers – Starrett[2] or equal with 1.0 mm graduations. The edges of a ruler used with a measuring frame must be straight and the edges must be the zero point.**
  - **300 mm (12 in)**
  - **500 mm (19.5 in)**
  - **1 m (39 in)**
- **Tarp – Canvas 3 m × 3 m (10 ft × 10 ft)**
- **Broom and dust pan**
- **Levels – for verifying the level of the test measure and taking headspace readings.**
  - **152 mm (6 in) Bubble Level**
  - **1 m (40 in) Carpenter Level**
- **Scale 15 kg (30 lb) (only used if the audit procedure is utilized.)**
- **Chutes for uncompressing and pouring the bedding into a test measure**
- **Test Measures (see Table 2. "Test Measures for Animal Bedding")**

[2] Notice: The mention of trade or brand names does not imply endorsement or recommendation by the U.S. Department of Commerce over similar products available from other manufacturers.

Table 1. Recommended Chute Dimensions

Nominal Capacity	Height	Width	Length
70 L (2.5 ft^3)	254 mm (10 in)	228 mm (9 in)	1219 mm (48 in)
100 L (3.5 ft^3)	254 mm (10 in)	279 mm (11 in)	1397 mm (55 in)
170 L (6 ft^3)	279 mm (11 in)	355 mm (14 in)	1727 mm (68 in)
240 L (8.5 ft^3)	304 mm (12 in)	406 mm (16 in)	2006 mm (79 in)
283 L (10 ft^3)	304 mm (12 in)	406 mm (16 in)	2286 mm (90 in)

NOTE: Chutes (see Figure 1. Testing Chutes) may be constructed using hinges and pins so that they lie flat for transporting. They can be constructed of sheet metal or with other slick surface material which enable the bedding to flow easily. The construction of the chutes used in this study allows the sides to move in or out slightly so that the bedding does not become clogged at the outlet. The heights and lengths may be adjusted slightly to fit into vehicles for transport but the widths should not be reduced because narrowing the opening can restrict material flow and result in "bridging" where the bedding collects and creates a block. Also, the width should be kept smaller than the opening of the test measure so that spillage does not occur during pouring.

Figure 1. Testing Chutes.

Table 2. Test Measures for Animal Bedding [NOTES: a, b, c, and d]
Only Interior Dimensions are Used for Volume Calculations
Must Be Calibrated with Traceable Measurement Standards Prior to Use

Rectangular and Square Test Measures

Actual Volume of the Measure [b & d]	Interior Wall Dimensions			Surface Area	Marked Increments on Ruler	Increment Volume
	Length	Width	Height[d]			
31.9 L 1.13 ft^3	213.4 mm (8.4 in)	203.2 mm (8 in)	736.6 mm (29 in)	43 362 mm^2 (67.2 in^2)		550.6 mL* 0.55 L (33.6 in^3)
28.3 L 1 ft^3	304.8 mm (12 in)	304.8 mm (12 in)	304.8 mm (12 in)			
63.7 L 2.25 ft^3	304.8 mm (12 in)	304.8 mm (12 in)	685.8 mm (27 in)			
	406.4 mm (16 in)	228.6 mm (9 in)	685.8 mm (27 in)	92 903 mm^2 (144 in^2)	12.7 mm (0.5 in)	1.18 L** (72 in^3)
92 L 3.25 ft^3	304.8 mm (12 in)	304.8 mm (12 in)	990.6 mm (39 in)			
	406.4 mm (16 in)	228.6 mm (9 in)	990.6 mm (39 in)			

*1.0 mm = 43 mL (2.6 cu in) ** 1.0 mm = 92 mL or 0.09 L (5.6 cu in)

Square Test Measures

Actual Volume of the Measure[b & d]	Interior Wall Dimensions			Surface Area	Marked Increments On Ruler	Increment Volume
	Length	Width	Height[d]			
77.4 L (2.73 ft^3)	381 mm (15 in)	381 mm (15 in)	533.4 mm (21 in)	145 161 mm^2 (225 in^2)		0.14 L (8.5 in^3)
144 L (5.09 ft^3)	508 mm (20 in)	508 mm (20 in)	558.8 mm (22 in)	258 064 mm^2 (400 in^2)	1.0 mm (0.03937 in)	0.25 L (15.2 in^3)
283 L (10 ft^3)	609.6 mm (24 in)	609.6 mm (24 in)	762 mm (30 in)	371 612 mm^2 (576 in^2)		0.37 L (22.5 in^3)

Cylindrical Test Measures

These dimensions are based on the tube having a ¼ inch wall thickness. Other tube thicknesses may be used.

Actual Volume *Volume* = $\pi r^2 h$	Interior Diameter (Outside Diameter)	Height	Surface Area *Area* = πr^2	Increment	Increment Volume
52 L (1.8 ft^3)	292.1 mm (304.8 mm) 11.5 in (12 in)	780 mm (30.70 in)	67 012 mm^2 (103.8 in^2)	1.0 mm (0.03937 in)	0.06 L (4 in^3)
124 L (4.3 ft^3)	444.5 mm (457.2 mm) 17.5 in (18 in)	800 mm (31.49 in)	155 179 mm^2 (240.52 in^2)		0.15 L (9.4 in^3)
279 L (9.8 ft^3)	596.9 mm (609.6 mm) 23.5 in (24 in)	1000 mm (39.37 in)	279 829 mm^2 (433.76 in^2)		0.27 L (16.4 in^3)

Table 2. Test Measures for Animal Bedding NOTES: a, b, c, and d
Only Interior Dimensions are Used for Volume Calculations
Must Be Calibrated with Traceable Measurement Standards Prior to Use

Notes for Table 2:

a. **Rectangular and Square Based Dry Measures are typically constructed of 12.7 mm to 19.05 mm (0.5 in to 0.75 in) marine plywood. A 4.76 mm ($^{3}/_{16}$ in) transparent sidewall is useful for determining the level of fill, but must be reinforced or be made of thicker material if it distorts when the measure is filled. 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 animal bedding. Any of these measures may be made without an attached bottom for ease of emptying if they are placed on a solid level base during filling and measurement.**

b. **Other size measures may be used if calibrated and the volume equivalence of the increment of 1.0 mm is no greater than $^{1}/_{6}$ the MAV. Widening the base of a measure reduces the column height of the product and will reduce compression but the trade-off is that the larger surface area increases the volume so the potential for measurement errors increase. One of the benefits of the cylindrical design is that, in addition to eliminating the 90 degree angles of the corners where gaps in fill frequently occur, the surface area of a cylinder is less than an equal volume square measure and that results in better resolution in the volume measurements (i.e., compare the readability of a 24 in sq box which has a surface area of 576 in^2, to the 24 in cylinder which has a surface area of 433 in^2). The height of the test measure may be reduced, but this will limit the volume of the package that can be tested.**

c. **If lines are marked in any test measures, they should extend around all 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 product is at or near the MAV.**

d. **If the measures are built to the dimensions shown above, the actual volume of most of the measures will be larger than the nominal volume so that plus errors (overfill) can be measured accurately.**

Test Note: Nothing in this section should be construed or interpreted as prohibiting the use of test measures meeting these specifications, or constructed in other geometric shapes or dimensions, or those made of other materials to test any other products.

3.15.2. Test Procedure

Test Notes:

Rounding: When a volume measurement falls between graduations on a ruler, round the value in the direction that favors the packer. This practice eliminates the issue of rounding from the volume determination and provides packagers the benefit of the doubt. The ruler graduation is 1.0 mm so the rounding error will be limited to 0.5 mm or less. It is good practice to circle a measurement that has been rounded up or make a statement to such effect so that it becomes a part of the inspection record.

Safety:

⚠ CAUTION

This procedure does not address all of the safety issues that users need to be aware of in order to carry out the following tasks. Users are sometimes required to conduct test in warehouse spaces

or retail stores where fork-trucks are in motion – care must be taken to warn others to avoid or exercise care around the test site. The procedure requires users to lift heavy objects including large bulky packages and test measures and includes the use of sharp instruments to obtain packages from shrink-wrapped pallets. Users may be required to climb ladders or work platforms to obtain packages. When opening and emptying packages, dust, and other particles may be present or escape from the packages which may cause eye injuries and respiratory or other health problems. Users must utilize appropriate safety equipment and exercise good safety practice. If safe working conditions cannot be ensured, suspend testing until the situation is corrected.

1. **Follow the Section 2.3.1. "Define the Inspection Lot" select "Category A, Sampling Plan" in this inspection. Determine the Sample Size based on the size of the Inspection Lot using Category A. Collect the sample packages from the Inspection Lot using Section 2.3.4. "Random Sampling Selection."**

Test Note: Place the test equipment and sample packages in a location where there is adequate lighting and ample space around the packages and equipment so the packages can be opened and the chutes and test measures used safely.

Test Note: If the package is not labeled with a usable volume it is opened and the contents are poured directly into the test measure.

Optional – Audit Screening by Weight

The full test procedure requires that all of the packages be opened for testing. Regardless of the type of bedding, the product cannot be returned to the original package. An alternative gravimetric auditing procedure may be used to reduce the amount of destructive testing and conserve inspection resources.

Audit Procedure: After randomly selecting the sample packages from the Inspection Lot, obtain the gross weight for each package. Select the lightest and heaviest packages and conduct a usable volumetric test these two packages. If the lightest and heaviest packages pass (i.e., each contains at least the useable volume declared on the label), it is highly likely that the remaining packages in the sample will also pass. Accept these two package samples as an AUDIT TEST and move on to inspect other types of bedding or Inspection Lots of other types or brands of bedding. If either of the two packages is found to have a minus error that exceeds the Maximum Allowable Variation, the sample fails. No further testing is required (i.e., assuming no MAV is allowed for the sample size (see Appendix A, Table 2-1. "Sampling Plans for Category A".) If either of the packages is found to have a minus error that does not exceed the MAV, continue to test all of the packages and take action based on the final results from the complete sample.

Test Note: If the gravimetric audit procedure is used, ensure that the scale is placed on a solid level support and that its accuracy has been verified to a test load that is at least 10 percent more than the gross weight of the packages (e.g., to estimate that load, place one of the packages on the scale and then test the scale with a load above the package's gross weight). See Section 2.2. "Measurement Standards and Test Equipment" for additional information.

2. **Select the appropriate test measure for the package size.**
   - **Spread a tarp large enough to hold a chute and test measure.**
   - **Place the chute and test measure on the tarp. Verify that the test measure is level.**
3. **Select a chute of appropriate capacity (see Table 1) for the package size and position it on the tarp.**
4. **Open the Packaging, Uncompressing and Pouring the Bedding into the Test Measure Twice.**

- **Open Package: Place the package in the chute and use a knife or box cutter to open and remove the wrapper. Spread the bedding uniformly along the length of the chute. The bedding is uncompressed in two steps. The first step is to loosen the clumps of bedding by gently pulling them apart (do not tear the fibers of cellulose bedding or "grind" any bedding between your hands because these practices break the material down). Spread your fingers and pick the material up using your hands from beneath to loosen it up. There should be no clumps of bedding in the chute. If any bedding has fallen out of the chute onto the tarp, collect it and return it to the chute. The following pictures illustrate this step of the procedure. The second step of the expanded volume recovery process is to pour the bedding into a test measure as described in Step 2.**

Exhibit 1.

Exhibit 2.

Exhibit 3. First pour into the test measures.

- **First Pour: The first pour into the test measure is only used to further un-compress the bedding so no measurements are taken. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not "dumped" (if it is "dumped" or poured too quickly some of the bedding will blow out of the measure or the bedding will be packed down and its volume reduced). The flow rate should be controlled by the tilt angle of the chute. The chute itself can be shaken but DO NOT HIT OR SHAKE THE TEST MEASURE. Also, do not touch the product to facilitate flow. (Do not adjust the flow by closing the opening of the chute as that may cause the bedding to heap up and then fall into the measure in clumps which may result in impact compression). Empty the bedding back into the chute and spread it out evenly along its length.**

Exhibit 4. Showing how to hold a chute for the pour.

Exhibit 5. Showing how to cradle the chute on one arm and holding it with one hand while tilting it with the other hand.

- **Second Pour: The second pour into the test measure is used to make the volume determination. Hold the chute above the test measure and tilt it so that you pour the bedding into the center of the test measure. The bedding should be poured slowly into the test measure in one continuous stream and not "dumped." The flow rate should be controlled by the tilt angle of the chute. The chute can be shaken but DO NOT HIT OR SHAKE THE TEST MEASURE.**

Test Note: Stop filling the measure if it appears that the test measure will overflow. The overflow product should be measured separately (use a smaller test measure of adequate size and capacity if one is available) and the multiple measurement volumes are added. If pouring into a square test measure, pour at an angle to two corners for the widest opening (see Exhibit 7).

Exhibit 6. Filling a 44 L Test Measure.

Exhibit 7. Filling a Square Test Measure at an Angle to use the Larger Opening.

5. Volume Determination.

DO NOT HAND LEVEL THE SURFACE OF THE BEDDING AS MANUAL LEVELING "PACKS" THE BEDDING AND REDUCES ITS VOLUME. DO NOT JAR OR SHAKE THE TEST MEASURE.

Test Note: Before using a test measure for volume determinations, place a level of adequate length on top of the test measure at five approximately equal measuring points across the top. A permanent marking pen can be used to evenly space the marks across the top edge of the test measure so that it can be positioned to take the measurements (see Exhibit 8. "Marking the evenly spaced measuring points across the top of the test measure.")

Exhibit 8. Marking the evenly spaced measuring points across the top of the test measure.

- **Place a rigid level or straight edge of adequate size on top the test measure and select a ruler of adequate length to reach to the lowest level of the top surface of the bedding. Start at the measuring points to your left or right, place the ruler against the side of the level, and hold it with either hand. The zero graduation is pointed down so the ruler can be lowered into the test measure for measurement. Lower the ruler into the test measure slowly until its end is at the surface level of the bedding (see Exhibits 9 and 10).**

Exhibit 9. Placing ruler into the test measure with zero end down.

Exhibit 10. Ruler shown with zero end at surface of the bedding.

- **Determine the depth of each measurement point from the surface of the bedding to the bottom edge of the straight edge and record the value in the appropriate space on the worksheet. Take a minimum of 9 measurements (at least 9 for cylindrical measures) across the top of the test measure in a grid pattern. Read the graduations on the ruler from a position that minimizes errors caused by parallax.**

Table 2. Illustrations of Depth Determinations with Cylindrical Test Measures

Figure 1. Shows how to read the depth of container.

The picture on the left (Figure 1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the to bedding in a 44 L test measure from a position that reduces parallax. The graphic below (Figure 2) illustrates the actual worksheet with the headspace procedure on the 44 L cylinder test measure (its internal radius is 151 mm and its height is 610 mm). The bedding was poured into the test measure but not leveled. Then 9 measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the 9 values was 479.88 mm which was subtracted from the height of the test measure to obtain 130.12 mm for the average height of the column of bedding in the measure.

The volume was calculated using: *Volume in liters* = $\pi r^2 h$ Pi) 3.14159265 × 23035.69 × 130.12 mm = 9.41 L*

***After the calculation was completed the result was divided by 1 000 000 to obtain the volume in liters.**

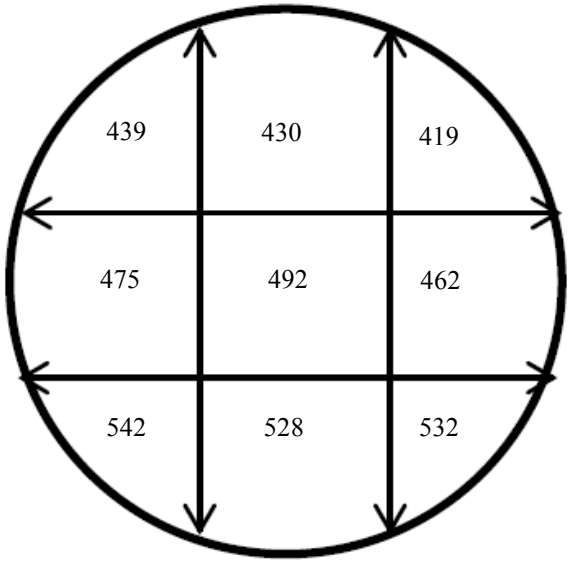


Figure 2. Illustration of Worksheet.

Table 2. Illustrations of Depth Determinations with Cylindrical Test Measures

Figure 3. Using the headspace measurement on a 279 L test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Figure 4. Illustrating how the ruler is placed on the bedding with the headspace method. The ruler is red from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures

Figure 1.

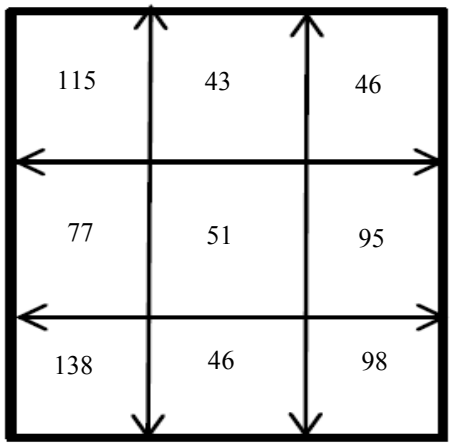


Figure 2.

The picture on the left (Figure 1) shows how to read the depth from the bottom of the straightedge (top edge of measure) down to the bedding in a 283 L square test measure from a position that reduces parallax. The graphic on the right (Figure 2) illustrates the actual worksheet with the headspace procedure on the square test measure (its internal dimensions are 609.6 mm × 609.6 mm × 762 mm (24 in × 24 in × 30 in). The bedding was poured into the test measure but not leveled. Then nine measurements were made at the locations shown on the grid to determine the depth of the product from the top edge of the measure. The average of the nine values was 78.77 mm that was subtracted from the height of the test measure to obtain 683.23 mm for the average height of the column of bedding in the measure.

The volume was calculated using: Volume in liters = lwh 609.6 mm × 609.6 mm × 683.23 mm = 253.89 L*

***After the calculation was completed, the result was divided by 1 000 000 to obtain the volume in liters.**

Figure 3. Using the headspace measurement on 56.6 L (2 cu ft) test measure. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

Table 3. Illustrations of Depth Determinations with Square Test Measures

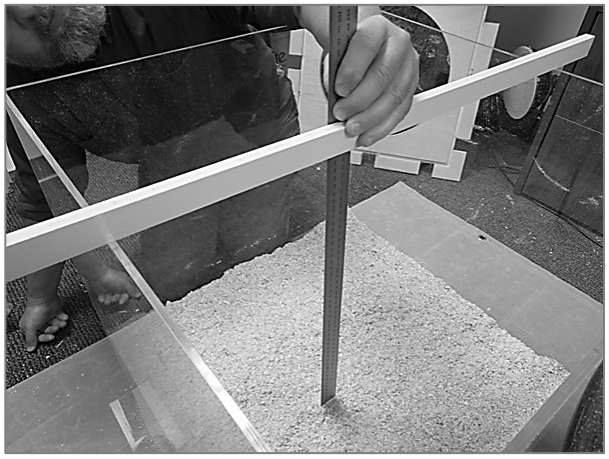


Figure 4. Showing how the ruler is placed on the bedding with the headspace method. The ruler is read from the bottom edge of a straight edge or level from a position that reduces parallax.

6. **Using a Worksheet for Volume Calculation**

   - **Enter the sample number of the package on the worksheet along with its labeled usable volume.**
   - **Test Measure Information**
     - **For a cylindrical test measure, enter its interior height and radius in the spaces labeled A and B.**
     - **For a square or rectangular test measure enter its interior height and the area of its base (i.e., length × width) in spaces labeled A and B.**
   - **Sum the measurements in the grid, divide the value by the number of measurements (i.e., 9), and enter this value in the space labeled C, Average Depth.**
   - **Calculate the Average Height of the Bedding (subtract C [Average Depth] from A [Interior Height of Test Measure]) and enter this value in the space labeled D.**
   - **Calculate the Volume of Bedding in the Package:**
     - **For a cylindrical test measure, the formula (*Volume in Liters* = $\pi r^2 h$) is shown in E on the worksheet. It is *Volume* (Liters) = 3.14159265 × r^2 (B^2) × Average Height (D) ÷ 1 000 000. Enter the package volume in the space provided for this value in E.**
     - **For a square or rectangular test measure the formula (*Volume in Liters = LWH)* is shown in E on the worksheet. It is *Volume* (Liters) = B (Area of Test Measure Base) × D (Average Height) ÷ 1 000 000. Enter the package volume in the space provided for this value in E.**
   - **Calculate the Package Error using the following formula:**
     - **Package Error = Labeled Usable Volume (Liters) − E Package Volume (Liters)**

Package Error (Liters) = Labeled Expanded Volume – Package Volume

- **Transfer the individual package errors (verify whether they are positive or negative) to the "Modified Standard Package Report for Animal Bedding" in Appendix D. Fill in the required header information. For Box 7, "Number of Unreasonable Package Errors Allowed for Sample Size, use Appendix A, to Table 2-1. "Sampling Plans for Category A, Column 4.", Based on the sample size, determine how many packages may have minus package errors that exceed the MAV (i.e., unreasonable package error).**

  Then:

- **Calculate the Total Error (Enter in Box 8. "Total Error").**

7. **Evaluation of the Test Results and Determination of Pass or Fail**

   - **Determine if any of the minus package errors exceeds the MAV. Apply a MAV value of 5 % (0.05 × labeled expanded volume) to single measurement volume determinations. If none of the minus package errors exceeds the MAV, go to Step 3. If any of the minus package errors exceed the MAV, enter the number of packages in Box 9 "Number of Unreasonable Minus Errors." Go to Box 10 "Is Box 9 Greater than Box 7?" and determine if the value exceeds the number in Box 7 "Number of Unreasonable Package Errors Allowed for Sample Size." If the number of packages with unreasonable errors exceeds the number permitted in Box 7 "Number of Unreasonable Package Errors Allowed for Sample Size," the sample fails. Go to Box 17 "Disposition of the Inspection Lot" and reject the Inspection Lot.**

   - **Calculate the Average Error for the sample by dividing Box 8 "Total Error," by Box 6 "Sample Size" and enter the value in Box 11 "Calculate Average Error," then go Box 12 "Does Box 11 equal Zero or Plus?" If the Average Error is zero or a positive number the sample passes, go to Box 17 "Disposition of the Inspection Lot" and approve the inspection lot. If the Average Error is a negative value go to Step 4. If the Average Error is a negative value go to Step 4 on the Inspection Worksheet.**

   - **Calculate the Sample Standard Deviation and enter in Box 13. "Compute Sample Standard Deviation." To obtain the Sample Correction Factor for the sample size use Appendix A, Table 2-1. "Sampling Plans for Category A," Column 3 "Sample Correction Factor" and enter that in Box 14 "Sample Correction Factor." Then calculate the Sample Error Limit by multiplying Box 13 "Compute Sample Standard Deviation" and Box 14 "Sample Correction Factor." Enter the value in Box 15 "Compute Sample Error Limit."**

     - **Disregarding the signs, determine if the minus in Box 11 "Calculate Average Error" is larger than the value in Box 15 "Compute Sample Error Limit."**

     - **If yes, the sample fails, go to Box 17 "Disposition of Inspection" and reject the Inspection Lot.**

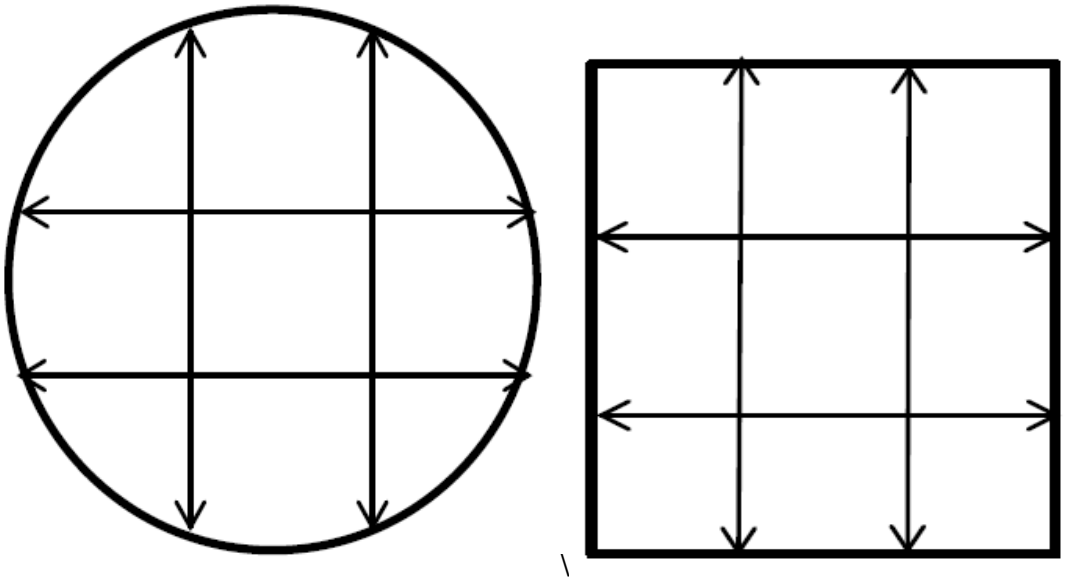
     - **If no, the sample passes, go to Box 17 "Disposition of Inspection" and approve the Inspection Lot**

   - **Prepare a comprehensive report of the test results and enforcement action taken and present the information to the party responsible for the product.**

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

	Maximum Allowable Variations (MAVs)
Animal Bedding	**5 % of the labeled volume**

Worksheet A – 9-Point Measurement Grid and Package Error Worksheet for Cylindrical and Square or Rectangular Test Measures



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Complete this for Cylindrical Test Measures
Sample Package _____ Labeled Expanded Volume (L): _____
A. Interior Height of Test Measure: _____ B. Radius of Test Measure (r): _____
C. Average Depth (Sum of Measurements ÷ 26): _____
D. Average Height of Bedding (= A − C): _____
E. Volume (L): _____ = 3.14159265 × r^2 (B^2): _____ × D: _____ ÷ 1 000 000
F. Package Error (L): _____ = Labeled Volume (L): _____ − E (L): _____
Volume is calculated using: *Volume in liters = $\pi r^2 h$ For example: if r^2 is 23035 and height of bedding is 109.26 then* ((Pi) 3.14159265 × r^2 (23035) × 109.26) ÷ 1 000 000 = 7.90 L

Complete this for Square or Rectangular Test Measures

Sample Package _____ Labeled Expanded Volume (L): _____

A. Interior Height of Test Measure: _____ B. Area of Test Measure Base (L × W): _____

C. Average Depth (Sum of Measurements ÷ 25): _____

D. Average Height of Bedding (= A − C): _____

E. Volume (L): _____ = B. Area of Test Measure Base: _____ × D: _____ ÷ 1 000 000

F. Package Error (L): _____ = Labeled Volume (L): _____ − E (L): _____

Volume is calculated using: *Volume in liters = (lw)h For example: If length and width are 609.6 the area of the measure's base is 371612. If the Average Height of the Bedding is 109.26 then:*

B. Area of Test Measure Base (371612) × Average Height of Bedding (109.26) ÷ 1 000 000 = 40.6 L

Date:	**Modified Standard Package Report for Animal Bedding**		**Sampling Plan A – Table 2-1., Appendix A. in NIST Handbook 133**		**Report Number:**
Location (name, address):		**Product/Brand Identity** **Lot Codes**	**Manufacturer:**		**Container Description:**
1. Labeled Quantity (Usable Volume):	**2. Unit of Measure:**	**3. MAV:** (5 % of labeled quantity)	**4. MAV:** (0.05 × Box 1. Usable Volume)	**5. Inspection Lot Size:**	**6. Sample Size (n):** **7. Number of Unreasonable Package Errors Allowed for Sample Size:**

Gross Weight for Audit Testing		**Package Error**		**Test Notes**
		−	+	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
		Total:	Total:	

8. Total Error:	**9. Number of unreasonable minus (−) errors (compare each package error with Box 4):**	**10. Is Box 9 greater than Box 7?** ☐ **Yes, lot <u>fails</u> go Box 17** ☐ **No, go to Box 11.**	**11. Calculate Average Error: (Box 8 ÷ Box 6 =)**

12. Does Box 11 = Zero (0) or Plus (+)? ☐ **Yes, lot <u>passes</u>, go to Box 17** ☐ **No, go to Box 13, 14, 15 & 16**	**13. Compute Sample Standard Deviation:**	**14. Sample Correction Factor:**	**15. Compute Sample Error Limit (SEL): (Box 13 × Box 14 =)**

16. **Disregarding the signs, is Box 11 larger than Box 15?** ☐ **Yes, lot <u>fails</u>, go to Box 17** ☐ **No, lot <u>passes</u>, go to Box 17**	**17. Disposition of Inspection Lot** ☐ **Approve** ☐ **Reject**

Comments*:*	**Official's Signature** **Acknowledgement of Report**

Background/Discussion:
This proposal will provide a standardized test method that will improve measurement accuracy at the point of pack and in testing at other locations. The test procedures recommend the use of a gravimetric audit procedure that may reduce destructive testing and reduce inspection time.

Even though some existing test measures may still be used, the proposal encourages users to purchase the prescribed volumetric test measures, chutes and measuring instruments.

The NIST, OWM will develop and provide technical training on this subject matter and develop detailed equipment designs and drawings, which will be made available on its website. The OWM will assist the animal bedding industry in implementing the proposed method of sale as well as developing and incorporating good manufacturing practices to ensure that the requirements of NIST Handbook 133 are met.

At the 2015 NCWM Interim Meeting, Mr. Whiting (American Wood Fiber) spoke in support of this test procedure. Mr. Whiting worked closely with NIST, OWM on reviewing this test procedure and agrees this procedure has less variability, sensitivity, is not time consuming, and is easier to perform in the field. A California county representative (regulator) suggested the definition for animal bedding should account for wood shavings and chips. He also inquired about the results when the procedure is used to test ground corn and cat litter? It was also remarked that building a chute as specified and lifting it on shoulders and pouring needs to be examined. Could this be done with smaller chutes and multiple pours? Mr. Whiting, who has performed this procedure, remarked that this may need two inspectors. He also remarked that denser particle sizes have repeatability. The NIST Technical Advisor remarked that the background information is being reviewed for formatting by the office publication coordinator and advised there would be no technical changes made as a result, and the revised item would be resubmitted in NCWM Publication 16 (2015). Refer to 2015 NCWM Interim Meeting, Report, Appendix C. for the Executive Summary, additional background and supporting information for "Testing Packages of Animal Bedding and Peat Moss with Compressed and Expanded Volume Declarations." The Committee agreed to move this forward as a Voting item.

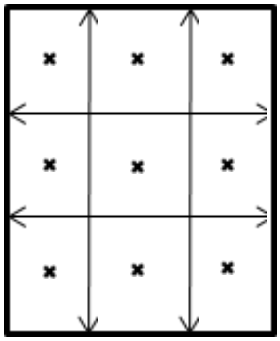
At the 2015 NCWM Annual Meeting, it was noted by the NIST Technical Advisor that the term "expanded volume: should read "usable volume" and the term "compressed" should be deleted from the section title. There was discussion as to how to test clay products when using chutes. Concern was expressed regarding the cost of purchasing testing equipment. The reason for the various vessel sizes is due to the variety of package sizes in the marketplace. The term "expanded" was changed to "usable" throughout the proposal along with minor editorial changes. This item was moved from Voting to Informational status.

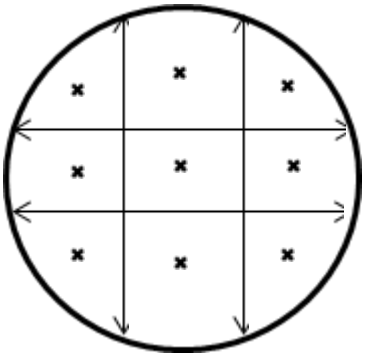
At the 2016 NCWM Annual Meeting, the Committee reviewed the comments from the regional reports. The regional modifications were from NIST, OWM. The Committee also concurs that there should be nine volume measurements across the surface area of the product to measure the depth in the vessel. Along with the following, there will need to be a review of the entire procedure by the NIST Technical Advisor to check the test procedure, math calculations, and modify the MAV table. The Committee is recommending that this be a Voting item with all applicable changes.

- To address the Test Procedure for Uncompressed Animal Bedding:
    - Add to Step 1 in the procedure the following test note: **Test Note: If the package is not labeled with a useable volume, it is opened and the contents are poured directly into the test measure.**
- To address the Test Measure Specifications and Designs:
    - Add the following test note to Section 3.10. and to the Tables for Recommended Test Measures for animal bedding. **Test Note: Nothing in 3.10. should be construed or interpreted as prohibiting the use of test measures meeting these specifications, or constructed in other geometric shapes or dimensions, or those made of other materials to test any other product.**
- To address comments on the Number of Volume Determination Measurements –

- Delete references in Step 5 and Tables 2 and 3 in regards to taking 26 measurements and replace with the following new language and graphics. **Take at least nine measurements across the surface area of the product to measure the depth of the product..**

For example:



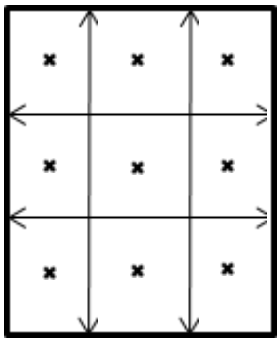


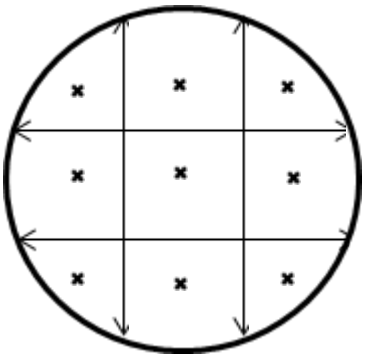
- In regards to comments on the Maximum Allowable Variation (MAV): The current recommendation that a 10 % MAV be applied when multiple measurements are taken to determine total package volume, pending future study, will be replaced with a 5 % MAV be applied to all tests of animal bedding.

Regional Association Comments:
At the 2015 WWMA Annual Meeting, a NIST Technical Advisor reported on the changes that are being submitted on the test procedure to address concerns raised at the 2015 NCWM Annual Meeting. The WWMA recommended that this be a Voting item with the following modifications:

- To address the Test Procedure for Uncompressed Animal Bedding:
  - Add to Step 1 in the procedure the following test note: **Test Note: If the package is not labeled with a useable volume, it is opened and the contents are poured directly into the test measure.**
- To address the Test Measure Specifications and Designs:
  - Add the following test note to Section 3.10. and to the Tables for Recommended Test Measures for animal bedding. **Test Note: Nothing in 3.10. should be construed or interpreted as prohibiting the use of test measures meeting these specifications, or constructed in other geometric shapes or dimensions, or those made of other materials to test any other product.**
- To address comments on the Number of Volume Determination Measurements –
  - Delete references in Step 5 and Tables 2 and 3 in regards to taking 26 measurements and replace with the following new language and graphics. **Take at least nine measurements across the surface area of the product. Take the measurements at points approximately equidistant from each other and the sides of the test measure.**

For example:





- Regarding comments on the Maximum Allowable Variation (MAV): The current recommendation that a 10 % MAV be applied when multiple measurements are taken to determine total package volume, pending future study, will be replaced with a 5 % MAV be applied to all tests of animal bedding.

At the 2015 CWMA Interim Meeting, a state regulator remarked that even though her state does not proactively regulate animal bedding, she appreciates having this method developed in the event there is a complaint in her state. CWMA believes the item is fully developed and recommended it be a Voting item.

At the 2015 NEWMA Interim Meeting, a comment was received from a state regulator noting his state uses this procedure and it works, but it is unlikely to be completed in one day. It is a long and tedious procedure and the commenter suggested there is room for improvement. The region believes this item has been fully developed and recommended that it be a Voting item.

At the 2015 SWMA Annual Meeting, it was recommended this be a Voting item with the amendments shown in the 2015 WWMA Annual Meeting report recommendation. The SWMA would like NIST to verify the accuracy of the "actual volume" compared to "dimensions" in Table 2. The SWMA recommends this be a Voting item.

At the 2016 NEWMA Meeting, Mr. Mike Sikula (New York) indicated support for this item and appreciates the reduction in measurements. NEWMA considers this item to be fully developed and supported the Voting status.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

260-6 D Recognize the Use of Digital Density Meters

Source:
Missouri (2016)

Purpose:
Allow the use of digital density meters for package checking of viscous fluids such as motor oils, diesel exhaust fluid (DEF) and antifreeze.

Item under Consideration:
Amend NIST Handbook 133 as follows:

Develop specific test procedures for NIST Handbook 133, "Chapter 3. Test Procedures – For Packages Labeled by Volume" that would recognize the use of digital density meters in lieu of volumetric flasks and thermometers when testing certain viscous fluids such as motor oil, DEF, antifreeze, syrups, etc.

Background/Discussion:
Current test procedures are slow and awkward due to the need of using borosilicate glassware for package checking. Digital density meters are fast, use small samples size (2 ml) and have built in thermometers.

Digital density meters are fast and accurate in comparison with recognized NIST Handbook 133 test procedures for viscous fluids. Using digital density meters equipped with built-in API density tables will not require the cooling samples to 60 °F. There is no need to "wet down" volumetric flasks before each measurement. Most non-food products may be recovered without contamination. Only a small sample size (2 ml) of the product is needed for testing. There is no need for a partial immersion thermometer or volumetric flasks. The current method in "Section 3.4. Volumetric Test Procedures for Viscous Fluids – Headspace" does not work for plastic oblong bottles often used for motor oil. This new test procedure would eliminate the entrapment of air in testing viscous fluids (i.e., motor oil, DEF, antifreeze, syrups, etc.). Well established ASTM and other international standard test methods are available with precision statements.

At the 2016 NCWM Interim Meeting, Mr. Ron Hayes (Missouri) spoke in regards to his submittal of this proposal. The Committee believes this item has merit and requested the submitter form an informal task group to further develop. Mr. Hayes agreed that this item needs to have additional data gathered to support the use and accuracy of the digital density meters. The American Petroleum Institute (API) remarked that they would like to assist the task group on this project. The Committee is recommending this as a Developing item.

Regional Association Comments:
At the 2015 CWMA Interim Meeting, Mr. Hayes (submitter) remarked that this proposal was submitted for both NIST Handbook 133 and NIST Handbook 44 and would streamline the process of volume measurement. Using one of several commercially available densitometers would eliminate the cost of extra work and time to wet and clean the flask for each measurement. It also eliminates cost due to breakage. This would be an alternative to the refereed method for volume measurement. An industry representative asked about products that did not have consistent density throughout such as hair conditioner. Mr. Hayes commented all products may not work with this alternate method but many would. Mr. Hayes recommended this be considered as a Developing item. CWMA forwarded the item to NCWM and recommended it be a Developing item to allow other regions an opportunity to comment.

At the 2015 SWMA Annual Meeting, a state official spoke in support of this item. The SWMA believes this item is fully developed and forwarded it to NCWM, recommending that it be a Voting item

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

260-7 D Incorporating Efficiencies into Inspections

Source:
Ventura County, California (2016)

Purpose:
Improve efficiency in the time and resources to conduct inspections where it is determined early in the testing that the lot is going to fail (NIST Handbook 133).

Item under Consideration:

1.2.3. Individual Package Requirement

The variation of individual packages contents from the labeled quantity must not be "unreasonably large." In this handbook, packages that are under filled by more than the Maximum Allowable Variation (MAV) specified for the package **labeled net quantity statement** are considered unreasonable **minus errors (UME)**. Unreasonable shortages are not generally permitted, even when averages in other packages in the *same* lot, shipment, or delivery

compensate for such shortages. **If during an official package inspection using "Category A" or Category B" sampling plan, the number of packages whose net values exceed the number of negative MAV's permitted for the sample size, then the lot fails and testing may be considered complete for the purpose of removing the lot from sell in its current condition. Completion of the official package inspection sampling plan for each lot is needed for further enforcement actions.** ~~**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.**~~

(Amended 2010 **and 20XX)**

Background/Discussion:
Current procedures in NIST Handbook 133 require inspectors to test all products in a sample before determining compliance of a lot; for example, Section 3.9. Peat Moss. If one follows the test procedure in Section 3.9.2.2. Test Procedure ("Open each package in turn, …"), every package must be opened, and its error determined before the results can be evaluated. Section 3.9.3. Evaluation of Results, then refers the inspector to Section 2.3.7. where Unreasonable Minus Errors (UMEs) are considered. Every test procedure in the Handbook has the same requirement. If an inspector determines that many of packages errors exceed the UMEs allowed before completing testing of all the packages in the sample, there is no provision to allow the inspector to reject the lot. All the packages must be tested. The submitter has tested peat moss where the first two packages had UMEs. This exceeded the number allowed in the sample and would, in the final analysis, have resulted in the rejection of the lot. Yet following the requirement of Section 3.9.2.2. the rest of the sample had to be tested, for a product that should have been rejected after the test of the first two packages. Requiring testing of the whole sample before determining the number of packages errors exceeding the number of UME's allowed is costly in time and resources. It would be far better to allow an inspector to reject a lot when, early in the testing, there are obvious multiple unreasonable minus errors that exceed the number allowed. This would shorten the overall testing time for products requiring extensive time to determine errors and still result in the same determination of compliance.

There are several products that require destructive testing and excessive testing times, sometimes 15 or 20 minutes for each sample (e.g., peat moss, mulch and soils, ice cream novelties, paint, compressed gas in cylinders). Requiring the testing of all packages in a sample for those products which require extensive and time consuming testing when it is apparent that the lot will fail because of an excess of UMEs, is an unnecessary waste of time and resources. Permitting rejection of a lot before all samples have been tested would eliminate an unnecessary and arduous procedure and provide an efficient resolution to the sampling of difficult to test products.

At the 2015 NCWM Annual Meeting during a discussion on the testing of peat moss, the NIST Technical Advisor stated the intent of the handbook was to allow the failure of a lot immediately on discovering excessive UMEs and this was taught in NIST Handbook 133 classes. Although this may be what the authors of NIST Handbook 133 intended, unless it is made clear through specific language, it is very possible that such action by an inspector could face a legal challenge.

It is realized that proposal option 1 affects many different sections of the Handbook 133 and, therefore, cannot address every specific section. If this proposal is supported by one or more of the regional weights and measures associations and forwarded to the L&R Committee, it will be up to the Committee and NIST Technical Advisors to identify and correct the language in each test procedure within the Handbook.

At the 2016 NCWM Interim Meeting, there was not a fully developed proposal for the Committee to consider. The Committee believes this item has merit and will return it to the submitter to develop a complete proposal. The Committee is recommending this as a Developing item.

Regional Association Comments:
At the WWMA Annual Meeting, a NIST Technical Advisor remarked that regulators can remove an inspection lot from sale for MAV non-compliance without completing the test as noted in NIST Handbook 133, Chapter 4; however, it is only listed under this one test procedure. The WWMA recommends Option 2, one "general" statement in Chapter 1, Sections 1.2.3. and/or 1.2.4. and/or or Chapter 2, Section 2.3.7.1. making a statement about the "Individual Package Requirement" and "MAV." No specific language was suggested to the NCWM L&R Committee. WWMA forwarded the item to NCWM, recommending it be a Voting item.

The submitter's original proposal is to amend NIST Handbook 133 as follows:

Option 1:

Amend each test procedure in NIST Handbook 133, indicated in 14 above, to make it permissive to allow the rejection of a lot if it is obvious that the number of UMEs exceeds the number allowed before all samples in the lot have been tested.

For each test procedure add the phrase "If an inspector, at any time during testing packages, determines the number of unreasonable minus errors exceeds the number allowed, the inspector may fail the lot without further testing and will not need to follow the requirements of Section 2.3.7. Evaluation for Compliance."

Option 2:

Make one "general" statement up front in Chapter 1, in Sections 1.2.3. and/or 1.2.4. and/or or Chapter 2, 2.3.7.1. where it addresses the Individual Package Requirement and MAV.

The general statement or explanation should say something along the lines that "nothing in NIST Handbook 133 or the test procedures are to be interpreted that an inspector must continue testing all samples when the number of MAVs allowed are exceeded. Once the MAVs allowed are exceeded, the lot fails and can be immediately rejected. It is not necessary (required) to continue testing the remainder of the packages in the sample. Reference to statements such as "every package must be opened and its error determined before the results can be evaluated" does not apply in cases where the number of allowed MAVs is exceeded".

At the 2015 CWMA Interim Meeting, a state regulator believed this item to be fully developed and ready for Voting status. Other state regulators agreed this is a commonsense protocol, which needs to be stated. A state regulator says he has already adopted this practice. The only issue to further consider is determining fines on MAVs where appropriate, but states will make that determination. CWMA forwarded the item to NCWM and recommended it be a Voting item.

At the 2015 NEWMA Annual Meeting, a retired state regulator remarked that this process has always been an option and the region does not believe this proposal is necessary. NEWMA did not forward it to NCWM.

At the 2015 SWMA Annual Meeting, it was noted that there was no specific proposed language. The SWMA believes this concept has merit but would like to see a specific proposal. The SWMA forwards this to the NCWM recommending this as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

270 OTHER ITEMS

270-1 D Fuels and Lubricants Subcommittee

Source:
The Fuels and Lubricants Subcommittee (2007)

Purpose:
Update the Uniform Engine Fuels and Automotive Lubricants Regulation in NIST Handbook 130 including major revisions to fuel ethanol specifications. Another task will be to update the Basic Engine and Fuels, Petroleum Products, and Lubricants Laboratory Publication.

Item under Consideration:
This item is under development. All comments should be directed to Dr. Matthew Curran, FALS Chair at (850) 921-1570, **Matthew.Curran@freshfromflorida.com**, or Ms. Lisa Warfield, NIST Technical Advisor at (301) 975-3308, **lisa.warfield@nist.gov**.

Background/Discussion:
At the 2016 NCWM Interim Meeting, the Subcommittee met on Sunday, January 10, 2016, at the NCWM Interim Meeting, in San Diego, California, to review many significant issues related to fuel and motor vehicle fluid standards appearing before the L&R Committee. The meeting began with an update from an agenda review teleconference, which was held on Tuesday, December 15, 2015. There were six items on the L&R agenda with one additional related item in the Method of Sale Section that were discussed by FALS. The meeting also consisted of updates from the three informal focus groups (IFG) working within FALS. Summaries are detailed below. Finally, a fourth informal focus group was formed within FALS during the Sunday meeting to investigate L&R Item 237-5, Section 4.1. Water in Retail Engine Fuel Storage Tanks relating to minimum requirements for water in fuel storage tanks.

Handbook 130 Harmonization IFG: Ms. Marilyn Herman (President, Herman and Associates) delivered an update to the FALS membership. Ms. Herman noted that the IFG has held several teleconferences and met at the 2015 NCWM Annual Meeting as well as at the ASTM International Meeting in Austin, Texas, in December 2015 to gather input and suggestions. The IFG has developed several drafts and has posted them on the NCWM collaboration site for all to review and comment. She encouraged members to continue to review the document and provide comment. While significant progress has been made, she noted that the project is going to take time due to the magnitude of possible changes to the Handbook as well as how to address the recently released Federal Trade Commission final rule pertaining to labeling requirements for ethanol blended fuels.

Renewable Diesel Labeling and Definitions IFG: Ms. Rebecca Richardson (MARC-IV Consulting) delivered an update to the FALS membership. Ms. Richardson noted that they had held several teleconferences and exchanged emails and were still trying to determine what course of action, if any, should be recommended through FALS in regards to the FTC labeling requirements for renewable diesel fuels.

CNG/LNG Equivalent Values IFG: Mr. Jeff Clarke (Natural Gas Vehicles [NGV] for America) delivered an update to the FALS membership. He reported that the IFG had met several times via teleconference and has developed a draft document detailing the results of research on energy content values. Mr. Clarke gave a PowerPoint presentation highlighting the current proposed values and how they were derived; more recent data concerning natural gas energy content and data on diesel energy content as provided by the Auto Alliance. The IFG research document is still in draft form and needs to be finalized so that it can be submitted as a finalized document to FALS. As a result, the IFG did not have any recommendations to bring to FALS at this time.

Organometallic Task Group: There was no update provided by the task group to FALS at the January 2016 meeting, but a ballot is moving its way through ASTM International that, if passed, would set a limit of 25 mg/L Mn for certain vehicle markets. The ballot has already passed through Subcommittee A and will soon be brought to the D02 Main Committee for a Vote. At the 2016 NCWM FALS meeting, Mr. Randy Jennings (TG Chair) remarked that the TG will disband and is requesting that NCWM continue to post the work of the TG on their website.

Regional Association Comments:
Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

270-2 D Packaging and Labeling Subcommittee

Source:
Packaging and Labeling Subcommittee (2011)

Purpose:
Provide an update of the activities of this Subcommittee, which reports to the L&R Committee. The mission of PALS is to assist the L&R Committee in the development of agenda items related to packaging and labeling. The Subcommittee will also be called upon to provide important and much needed guidance to the regulatory and consumer packaging communities on difficult questions. PALS will report to NCWM L&R Committee. The Subcommittee is comprised of a Chairperson and eight voting members.

Item under Consideration:
This item is under development. All comments should be directed to Mr. Chris Guay, Packaging and Labeling Subcommittee Chair at (513) 983-0530, **guay.cb@pg.com** or Mr. David Sefcik, NIST Technical Advisor at (301) 975-4868, **david.sefcik@nist.gov**.

Background/Discussion:
The Package and Labeling Subcommittee (PALS) is comprised of four voting regulatory officials (one from each region) and four voting from industry (retailers and manufacturers) in addition to its Chair and NIST Technical Advisor. Mr. Guay, PALS Chair, reported that work is currently being held through monthly webinar meetings and at the NCWM meetings. Members of NCWM can participate in the PALS webinar meetings by contacting Mr. Guay. PALS members are responsible for providing updates at their Regional Meetings. Mr. Guay added that PALS will be developing proposals and providing guidance and recommendations on existing proposals as assigned by the NCWM L&R Committee. He also stressed the importance of having key federal agencies (FDA, FTC, and USDA) participating.

Mr. Guay reported the Subcommittee is working on a Recommended Practice Document for quantity expressions appearing on the principal display panel (PDP) in addition to the statement of net quantity and is also considering further development of the following items:

- **Additional Net Content Declarations on the Principal Display Panel** – Package net contents are most commonly determined by the product form, for example – solid products are labeled by weight and liquid products are labeled by volume. Semi-solid products such as pastes, creams, and viscous liquids are required to be labeled by weight in the United States and by volume in Canada.
- **Icons in Lieu of Words in Packaged labeled by Count** – Can a clear and non-misleading icon take the place of the word "count" or "item name" in a net content statement? While existing Federal regulation requires regulatory label information to be in "English," the increasing presence of multilingual labels and the growing diversity of the U.S. population suggest more consumers are served with a clear and non-misleading icon.
- **Multilingual Labels**
- **Multipacks and Bundle Packages** – The net content statements for multipacks and bundled packages of individually labeled products can be different based on the approach used to calculate them. The difference is the result of the degree of rounding for dual inch-pound and metric declarations. Using two apparently valid but different methods can yield one net content statement result, which provide better accuracy between the metric and inch-pound declarations and a different net content result; which is consumer friendly.

At the 2015 NCWM Interim Meeting, Mr. Guay (PALS Chair) reported that PALS was making progress on a Recommended Practice Document for quantity-related statements appearing on the package net content statement outside of the required statement of net quantity. He noted that no guidance or regulation exists for these types of statements and, thus, every manufacturer creates their own approach. A Recommended Practice Document is expected to help bring uniformity and consistency by providing a reference for these types of label statements. This document will either be a stand-alone document on the NCWM website or included as part of another NCWM publication.

At the 2015 NCWM Annual Meeting Mr. Guay reported that FTC has recommended adoption of five amendments recommended by PALS into their final FPLA regulations. FTC also responded to each recommendation made by PALS. FTC did not propose adoption of amendments from any other source.

Mr. Guay and Angela Godwin (Ventura County, California) gave an abbreviated presentation providing details of the developing Recommended Practice Document to build awareness and to get broader input on this item. The Subcommittee's goal is to have the document drafted by early 2016, so that it can be refined and edited prior to the 2016 NCWM Annual Meeting. It is expected to be submitted for regional review in the fall of 2016.

At the 2016 NCWM Interim Meeting, Mr. Guay and Mr. Hal Prince (PALS SWMA representative) gave a presentation on the developing Recommended Practice Document. PALS noted this document is envisioned to be a stand-alone document on the NCWM website and that PALS is targeting to have the document drafted by April 2016 with the goal of getting broader review of NCWM membership prior to submission as a formal NCWM item.

At the 2016 NCWM Annual Meeting, Mr. Guay reported that the Subcommittee continues to address questions and issues surfacing as the Subcommittee works on the Recommend Practice Document.

Regional Association Comments:
WWMA received a presentation by Mr. Chris Guay (Procter & Gamble) and Ms. Angela Godwin (Ventura County, California) on the draft document on quantity related statements appearing on the principal display panel outside the required statement of net quantity. WWMA appreciates the PALS' work and recommended that this item remain as a Developing item.

SWMA recommended that this item remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

270-3 D Moisture Allowance Task Group (MATG)

Source:
Moisture Allowance Task Group (2012)

Purpose:
This Task Group will provide additional guidance for making moisture allowances for products not listed in NIST Handbook 133.

Item under Consideration:
This item is under development. All comments should be directed to Mr. Kurt Floren, Moisture Allowance Task Group Chair at (626) 575-5451, **kfloren@acwm.lacounty.gov** or Ms. Lisa Warfield, NIST Technical Advisor at (301) 975-3308, **lisa.warfield@nist.gov**

Background/Discussion:
NCWM 2012 Interim Meeting: Ms. Cardin, Committee Chair, will be requesting that the NCWM Board of Directors form a new Task Group to review moisture allowance. The 2012 L&R Committee designated this item as a Developing item.

At the 2012 NCWM Annual Meeting, Mr. Floren (Los Angeles County, California) announced that he will Chair the Moisture Allowance Task Group.

At the 2013 NCWM Interim Meeting, Mr. Floren announced that he is seeking a representative from each region for the MATG. He would prefer a representative from each region. Currently, the following regions have provided a representative; NEWMA, Mr. Frank Greene (Connecticut) and WWMA, Mr. Brett Gurney (Utah). The following individuals have also expressed interest: Ms. Maile Hermida (Hogan Lovells US, LLP), Ms. Ann Boeckman (Kraft

Foods Group), and Mr. Chris Guay (Procter and Gamble Co.). Mr. Floren remarked that meetings will be held via web-meetings and at the NCWM Conferences.

At the 2014 NCWM Interim Meeting, the MATG discussed how to proceed forward on this item and reviewed history of prior work done. At the 2014 and 2015 NCWM Annual Meetings, Mr. Floren informed the Committee that there has been scheduling conflicts with other priorities this past year, and he has not had the opportunity to get a meeting scheduled. Mr. Floren would like to opportunity to continue chairing this group and will pursue this item.

At the 2016 NCWM Interim Meeting, Mr. Floren met briefly with the MATG to review some historical documents on the subject matter. Mr. Floren intends to hold teleconference meetings with the TG in order to proceed on this item.

At the 2016 NCWM Annual Meeting, Mr. Floren requested the Task Group be designated as an Informal Focus Group. There is extensive data and research that needs to be performed prior to the group making a recommendation to the Committee. The Committee agrees with Mr. Floren's request, and the L&R Chair will request a new designation for the MATG as an Informal Focus Group from the NCWM Chair.

Regional Association Comments:
WWMA heard no update on this item, but meetings are being planned for the near future. WWMA supports the MATG's planned work and recommended that this item remain as a Developing item.

SWMA recommended that this item remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP 1210, 2015).

Mr. Richard Lewis, Georgia | Committee Chair
Mr. Louis Sakin, Towns of Hopkinton/Northbridge, Massachusetts | Member
Mr. John Albert, Missouri | Member
Ms. Ha Dang, San Diego County, California | Member
Mr. Ethan Bogren, Westchester County, New York | Member
Ms. Rebecca Richardson, Marc - IV Consulting| Associate Membership Representative
Mr. Lance Robertson, Measurement Canada | Canadian Technical Advisor
Ms. Lisa Warfield, NIST, OWM | NIST Technical Advisor
Mr. David Sefcik, NIST, OWM | NIST Technical Advisor

Laws and Regulations Committee

Appendix A

Items: 232-4 and 260-3: Handbooks 133 and 130

Proposed Amendments to NIST Handbook 133[3], Section 3.14. "Firewood" and NIST Handbook 130[4], Uniform Method of Sale of Commodities Regulation, Section 2.4. "Fireplace and Stove Wood"

Subject: The National Institute of Standards and Technology (NIST) Handbook 133, "Checking the Net Contents of Packaged Goods," – Section 3.14. "Firewood (Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less)" and Section 2.4. "Fireplace and Stove Wood" in the Method of Sale of Commodities Regulation in NIST Handbook 130 "Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality").

History: The volumetric test procedures for firewood in NIST Handbook 133, Section 3.14. were adopted at the 83rd National Conference on Weights and Measures (NCWM) Annual Meeting in 1998. The historical record accompanying the proposal provides limited guidance on how the test procedures are to be applied in the field. "The Report of the 83rd National Conference on Weights and Measures" for the 1998 Annual Meeting is published in NIST Special Publication (SP) 932 (1998) on pages L&R 19 and in Appendix B on page L&R 31.

Proposals: Proposed revisions to Section 2.4. "Fireplace and Stove Wood" in the Method of Sale of Commodities Regulation (MOS) of NIST Handbook 130 are presented in Part 1 beginning on page 5. Proposed revisions to the firewood test procedures in NIST Handbook 133, Section 3.14. are presented in Part 2 beginning on page 7. Included in Appendix A, on page 27, is a draft revision of Section 3.14. for consideration by the Laws and Regulations Committee.

Executive Summary

Sales of firewood have increased in recent years.[5] According to the National Firewood Association sales of firewood exceeds $2 billion a year.[6] Recent inspections of packaged firewood by weights and measures officials in different states and at least one court case recently uncovered a lack of uniformity in the procedures used to test packaged firewood. Section 3.14. of NIST Handbook 133 is written ambiguously such that if the same bundle of firewood were tested by different states, the test results would be substantially different. Any test procedure written as vaguely as Section 3.14. would likely be found to violate due process. The problems described below were uncovered through limited testing and research. However, after reviewing historic information and test data, it is apparent there is a need to clarify the procedures and improve the accuracy of the measurement procedures so the volume of wood in bags, bundles, and boxes are determined accurately and consistently. Improving the test procedures will help ensure consumers can make value comparisons and reduce unfair competition.

During this study, it was revealed that much of the packaged firewood sold in packages less than one cubic foot is labeled in fractions of a cubic foot instead of cubic inches as required in Section 2.4. in NIST Handbook 130, Method of Sale of Commodities Regulation. Additionally, some of the ambiguous wording in this regulation may conflict

[3] NIST Handbook 133 "Checking the Net Contents of Packaged Goods" (2015) -**www.nist.gov/pml/wmd/pubs/hb133.cfm**

[4] NIST Handbook 130 "Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality" (2015) – **www.nist.gov/pml/wmd/pubs/hb130.cfm**

[5] **www.eia.gov/todayinenergy/detail.cfm?id=15431#**

[6] **nationalfirewoodassociation.org/nfa-press-release-mar-21-2013/**

with the Uniform Packaging and Labeling Regulation (UPLR). Included below are proposals to revise the method of sale to recognize traditional industry labeling practice and eliminate language that appears to conflict with the requirements of the packaging and labeling regulation. Proposals to address these issues are included below. The following information and recommendations are based in part on comments and suggestions from weights and measures officials who participated in a "Training Summit" held at NIST in April 2015. During the meeting, participants evaluated the current NIST Handbook 133 firewood testing procedures. Participants developed several suggested improvements to the procedures for determining length and area. Recommendations were also received from several firewood packers. Because few states are testing packaged firewood, and those that do are finding shortages across the industry, increased oversight of this product is recommended.

Background: In NIST Handbook 130, in the "Uniform Method of Sale of Commodities Regulation (MOS)" [7] a cord is defined in Section 2.4. "Fireplace and Stove Wood." The MOS describes how a cord must be compactly stacked and includes other requirements regulating the sale of fire and stove wood. (See Appendix C [page 49].) States that adopt the method of sale for firewood use the procedures in NIST Handbook 133 to verify the declared volume of wood.

> ***2.4.1. Definitions.***
>
> ***2.4.1.1. Fireplace and Stove Wood.*** *– Any kindling, logs, boards, timbers, or other wood, natural or processed, split or not split, advertised, offered for sale, or sold for use as fuel.*
>
> ***2.4.1.2. Cord.*** *– The amount of wood that is contained in a space of 128 ft^3 when the wood is ranked and well stowed. For the purpose of this regulation, "ranked and well stowed" shall be construed to mean that pieces of wood are placed in a line or row, with individual pieces touching and parallel to each other, and stacked in a compact manner.*

A cord includes in the total volume the wood, bark, and air between the pieces. The requirements that firewood be "ranked and well stowed" and "stacked in a compact manner" are intended to prevent deceptive sales practices used by unscrupulous wood sellers who use crisscross stacking or deceptive terms such as the "face-cord" or "green" cord (i.e., the volume of the wood before it is split). A cord of wood sold unsplit will have less volume once it is split. For this reason it is important that sellers and consumers understand the basis of the sale to avoid complaints. Under most state laws, the amount of wood delivered to the consumer, regardless of whether it is split or unsplit, with bark on or off, unseasoned or seasoned, must equal at least 128 ft^3 when stacked as specified in Section 2.4.1.2. "Cord." Under the MOS, Section 2.4.3. "Quantity," item (a) "Packaged natural wood" packaged firewood in volumes less than $^1/_8$ cord must be labeled in liters, cubic feet, or cubic inches (in packages under 1 ft^3) and fractional parts of those units. There are variations in the laws and regulations of other states, but most state regulations are similar to the requirements presented in NIST Handbook 130.

Estimated Impact of Measurement Errors on Package Volume (see Notes a. and b. below)

In a limited study of firewood packages conducted at NIST, the current length measurement procedures, which require that length measurements be made along the centerline of the five pieces having the greatest girth, did not (for the samples collected from four packers) result in an average length that accurately represented the average length of all of the pieces in the package. Similarly, the current procedure for using one-inch square graph paper to determine the areas of the bundle ends resulted in large variations in the area of the ends (results for the same bundle area varied as much as 7 in^2 among different inspectors who carried out the measurements). Even small variations in measurement can result in significant errors in the volume of a package. Implementing new measurement procedures and equipment to improve the accuracy of the measurements taken in the wood test procedures will benefit consumers and packers alike.

For example:

[7] NIST Handbook 133 does not define a Cord of wood. Instead, it provides test procedures used to enforce the packaging and labeling requirements in NIST Handbook 130, Uniform Packaging and Labeling Regulation, Section 12. "Variations to be Allowed."

A one-inch error made in the average length determination of the wood pieces in a package will result in an error of about 75 in^3 in volume (or about 19 in^3 for each ¼ in).

A 5 in^2 error in the average area determination of the bundle ends will result in a volume error of about 80 in^3 (about 16 in^3 for each 1 in^2 and 4 in^3 for a ¼ in^2).

Notes:

a. The volume formula for bundled firewood in NIST Handbook 133, Section 3.14.c. Bundles and Bags of Firewood is similar to the Smalian Cubic Volume Rule published in the National Forest Log Scaling Handbook (FSH 2409.11a) on Cubic Scaling. The scaling handbook is published by the USDA Forest Service at www.fs.fed.us/fmsc/measure/handbooks/index.shtml. The Smalian Cubic Volume Rule uses the formula for finding the volume of the frustum (e.g., a cone like shape with the tip removed) and was developed to determine the cubic foot volume of a single log. A simple version of the formula is shown as $V = (A + a) \div 2 \times L$, which is similar to the NIST Handbook 133 formula. This is where: V = Volume in Cubic Feet; A = Large-End Cross-Section Area (ft^2); a = Small-End Cross Section Area (ft^2); and L = Length of pieces in the bundle.

b. The estimated errors mentioned above were calculated using the NIST Handbook 133 modified version of the Smalian rule (using inches instead of feet) to develop the following tables:

Bundle Volume Calculations – Impact of Length Variations on Volume		
Average Area of Ends (in^2)	**Average Length of Pieces (inch)**	**Volume in^3**
75	16.00	1200
75	16.25	1219
75	16.50	1238
75	16.75	1256
75	17.00	1275

Bundle Volume Calculations – Impact of Area Variations on Volume		
Average Area of Ends (in^2)	**Average Length of Pieces (inch)**	**Volume in^3**
75	16.00	1200
76	16.00	1216
77	16.00	1232
78	16.00	1248
79	16.00	1264
80	16.00	1280

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Recommendations for Consideration by the NCWM Laws and Regulations Committee

Part 1. NIST Handbook 130 – Uniform Methods of Sale of Commodities - Section 2.4. Fireplace and Stove Wood

The following recommendations attempt to clarify the method of sale for firewood in Section 2.4. Fireplace and Stove Wood.

A. Determine how "Cooking Woods," "BBQ Wood" and Flavoring "Chunks" are to be sold.

There is a sector of the firewood industry which sells chunks and split firewood from many types of trees for use in restaurants and homes for smoking and flavoring foods. Currently Section 2.4.3.(c) Quantity, requires "stove wood pellets or chips" no larger than 15 cm (6 in) to be sold by net weight, but the wording specifically excludes flavoring chips. (See Figures 1a and 1b.)

(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)

The types of "chunk" wood may include apple, cherry, mesquite, pecan, oak, chunks of "BBQ wood" and used whisky barrels. Some online sellers offer packages of these varied products for sale by net weight and "approximate" net weight but others sell by volume. Some sites also offer split logs by volume and "wood chunks" by net weight. The variations in the sizes and shapes of the wood being sold for flavoring and cooking are significant (in some advertisements the chunk sizes range from 2 in to 4.5 in) so that may be why some sellers have switched to net weight, perhaps believing they fall under Section 2.4.3.(c). It must be determined if, under Section 2.4. Fireplace and Stove Wood, "cooking wood" and "chunks" are included under the terms "flavoring chips" and if the method of sale for those products, which, according to Section 2.4.3.(d) must be sold by volume is appropriate, or if they fall under Section 2.4.3.(c) which permits sales by net weight. If the latter is preferred, then the subsection should be amended to allow flavoring "chunks" to be sold by net weight.

Figure 1a. Chunks Sold by Volume in Bags

(Photo provided by Cooking Woods of Seattle, Washington.)

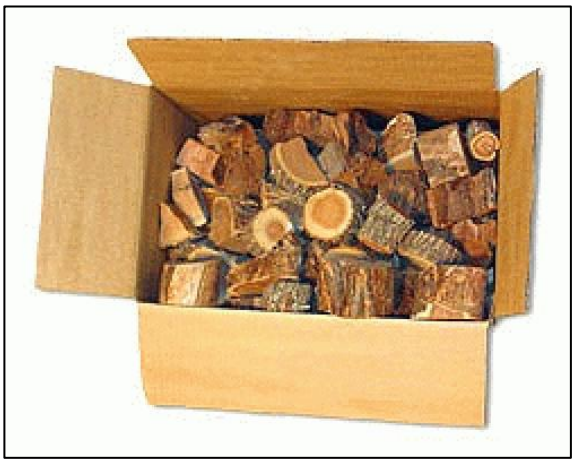


Figure 1b. Chunks Sold by Weight

(Photo provided by Firewood.Com of Minnesota.)

URLs for sites selling "Cooking Wood"

- www.cookingwoods.com
- firewood.com
- www.wileyscookingwoods.com

B. Amend Current Method of Sale for Packaged Firewood.

Amend the current method of sale to recognize the traditional practice of offering packaged firewood for sale in quantities less than 1 cubic foot by fractions of the cubic foot instead of by cubic inches as required in Section 2.4.3.(a)(2). Harmonize the packaging requirements of the Uniform Packaging and Labeling Regulation (UPLR) with the Method of Sale for Packaged Firewood to reduce the possibility of confusion.

Based on information from several industry sources and weights and measures officials, the current labeling on packaged firewood has the quantity declared in fractions of a cubic foot (e.g., 0.6 ft^3, 0.7 ft^3 and 0.75 ft^3) and by cubic decimeters (dm^3). The use of these units on these package sizes does not comply with the method of sale requirements in Section 2.4.3. "Quantity."

1. Customary Units

Currently Section 2.4.3. "Quantity," requires that packages of firewood and flavoring chips less than 1 ft^3 to be sold by cubic inches and liters. Sale of packaged natural wood by the cubic foot instead of the required cubic inches appears to be a nationwide, traditional sales practice. The labeling by the cubic foot appears to provide consumers with quantity information in a unit of measure they understand, and they can use in making value comparisons against firewood offered for sale by the cord or fractions of a cord. The Office of Weights and Measures (OWM) recommends that the method of sale be revised to require natural wood to be sold by the cubic foot or fractions thereof in order to recognize traditional industry sales practice. No change to the method of sale for flavoring chips and kindling is proposed at this time except to request the interpretation regarding cooking wood and flavoring chunks discussed above.

2. Metric Units

In 1994 the requirement that packages subject to the UPLR include metric units in their quantity declarations was adopted. At that time, the consensus of the NCWM working group, which developed the metric revisions to the UPLR, was due to consumers being familiar with the term liter (l or L) rather than the term cubic decimeter (dm^3) even though the quantities are exactly the same. At that time, the methods of sale for peat moss, pine bark mulch, and other products were revised to require the use of the liter instead of cubic decimeter to facilitate consumer understanding of metric units and quantities by requiring a more familiar metric unit to appear on a wide range of packages and quantities. Today, 21 years after the mandatory use of the liter was first implemented, consumer acceptance and understanding of what a liter is and the amount of product it represents is greater than it was in 1994, so the requirement that metric volumes must appear on labels in terms of the liter should not be changed.

Packages subject solely to the UPLR (i.e., they are not subject to the federal Fair Packaging and Labeling Act) may be offered for sale only in metric units (customary units may also appear on the principal display panel at the option of the packer). As currently written in the Method of Sale, Section 2.4.3., subsections (a)(1) and (d)(1) require packages be labeled in "liters, to include fractions of liters; or" which may confuse readers by making it appear that liters are only one option for how quantities must be shown. That wording is inconsistent with the declaration of quantity requirement in the UPLR, Section 6.1. "General" that requires all packages to bear a declaration of quantity in both metric and customary units (an exemption in Section 11.33. of the UPLR makes customary units optional). An editorial change must be made to Section 2.4.3. for both natural wood and flavoring chips to clarify that a packer must provide a declaration of quantity in metric units in terms of the liter and that customary units may appear on the package, but they are optional.

3. Implementation Period

If adopted, the amendment to allow sales of packaged natural firewood by the cubic foot will go into effect on January 1 of the year following NCWM adoption. However, since it will take time for packers to learn of the changes and to add metric units to their packaging or change cubic decimeter to liters, a period of three years from the effective date of the revised regulation should be allowed for the changeover.

4. Proposed Revision

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:

(1) liters, to include fractions of liters; **and may also include a declaration of quantity in terms of:** ~~**or**~~

~~**(2) cubic inches, if less than one cubic foot; or**~~

~~**(3)**~~ **i.** cubic **foot,** ~~**feet, if one cubic foot or greater,**~~ **to include fractions of a cubic foot**; **or**

ii. cubic feet to include fractions of a cubic foot.

Note: Implementation for the requirement for use of the liter in (1): packages may continue to show the dm^3 ~~**instead of the liter (L) for three years after the effective date of this regulation to allow for the use of current packaging inventories.**~~

Note: The amended language regarding the liter in (1) must also be added to (d) Flavoring chips.

Part 2. NIST Handbook 133, Checking the Net Contents of Packaged Goods, Section 3.14. Firewood

The following recommendations attempt to clarify the test procedures in Section 3.14. Firewood. Refer to Appendix A for a complete version of the proposed test procedures.

A. Adopt a Maximum Allowable Variation (MAV) for Packaged Firewood.

A limit on negative errors is not currently applied to inspections of packaged firewood. Adding a MAV requirement for packaged firewood would protect consumers in cases where plus errors in some packages results in the sample passing the average requirement but one or more packages are found to have large minus errors.

For example:

In an inspection of a lot of 83 – 0.75 ft^3 firewood bundles, an inspector finds 10 packages in a 12 package sample have errors that fall within + 51 to + 86 in^3. Then two packages are found to have minus errors of − 345 in^3 and − 380 in^3. After calculating the average error, the sample passes and all 12 packages remain on sale but at least two customers may purchase packages that are under filled by more than 25 %.

According to NIST Handbook 133, Appendix A., Table 2-10 "Exceptions to the Maximum Allowable Variations (MAV)," no limit is placed on negative errors in packages of firewood (e.g., several bundles, bags, or boxes in the sample could be nearly empty and no action would be taken on the sample except on the basis of the Average Requirement). There is no information in the adoption history for this item to indicate why the individual package (MAV) requirement is not applied. The MAV requirement provides important protection for consumers and helps ensure fair competition. Applying an MAV is reasonable since measurements are generally rounded in

favor of the packer and because other difficult to measure products, such as mayonnaise (which is also tested with a headspace procedure), mulch, and animal bedding are required to meet an MAV requirement. A specific MAV also guides packers in their packaging and quantity control programs in setting control limits to ensure that the lot, shipment, or delivery meets the labeled quantity, and it meets the Average Requirement. From the consumers' perspective, it is reasonable to expect to receive a package that has at least 75 % or more of its declared contents (most packages covered by NIST Handbook 133 MAVs are required to contain at least 98 % or more of the product). Based on a review of limited test data having no limit on minus errors does not appear to be reasonable. It is recommended that a 25 % MAV value be adopted for the limit on minus errors pending further study unless packers provide an alternative value based on current quantity control data. This value could be modified by the NCWM in the future if test data collected by weights and measures officials and packers using the proposed test procedures indicates that a different MAV value is justified.

Recommendation: Eliminate the exemption for packaged firewood labeled by volume from the individual package requirement. Adopt a MAV (e.g., 25 %) to prevent excessively under filled packages from being offered for sale. Most packaged firewood has a labeled volume of 21.2 L [0.75 ft^3] (1296 in^3) so the 25 % MAV would equal 5.3 L or 324 in^3. (See excerpt from Table 2-10 below.)

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

	Maximum Allowable Variations (MAVs)
Packaged Firewood and Stove Wood Labeled by Volume	**25 % of labeled quantity** **Note: Use Table 2-5. "Maximum Allowable Variations for Packages Labeled by Weight" for packaged artificial and compressed fireplace logs and stove wood pellets and chips labeled by weight**.

B. Current Exemption to MAV Applies Only to Packages Labeled by Volume:

In the original 1998 proposal to the NCWM, an exemption from the MAV for packaged wood sold by volume in boxes, bags, bundles, and stacks was included. As a result, there is no limit on negative errors in packages and stacks of firewood sold by the cord or subdivisions (i.e., a box or bag could be 75 % empty and no action could be taken based on individual package errors). Accordingly, NIST Handbook133, Appendix A, Table 2-10 "Exceptions to the Maximum Allowable Variations (MAV)" was revised to include an exemption for "Packaged Firewood" but wording to limit the restriction to packages or stacks sold by volume was inadvertently omitted. Because wood pellets and some cooking wood and flavoring chips are sold by weight, it is possible that an inspector might apply the exemption to packages sold by weight, when it was originally intended only to apply to packages labeled by volume. To correct this oversight, NIST will editorially revise NIST Handbook133, Appendix A, Table 2-10 in the next edition of Handbook 133 to indicate that the exemption only applies to packages sold by volume as shown above. (See firewood.com/index.cfm/pageid/21 and hjnfirewood.com/#!shop-now/ckj2).

Recommendation: Editorially revise NIST Handbook 133, Appendix A., Table 2-10. to read "Packaged Firewood and Stove Wood labeled in Terms of Volume" and add the following note to Table 2-10:

Note: Use Table 2-5 "Maximum Allowable Variations for Packages Labeled by Weight" for packaged artificial and compressed fireplace logs and stove wood pellets and chips labeled by weight.

C. Clarify Section 3.14.1 Test Equipment, Improve Accuracy, and Reduce Rounding Errors

1. The words "Linear Measure" should not be part of the title. This is a printing error and will be corrected in the next edition.

2. The instruction to "round up" measurements is not clear about which values are to be rounded and also conflicts with the guidance to "Round measurements down to the nearest …" in the headspace test method used in Section 3.14.2.a. Boxed Firewood procedure.

Recommendation: Amend this sentence by adding the phrase "Measurements shall be read to the smallest graduation on the ruler or tape. Round any value that falls between two graduations up to the higher value except when making headspace depth measurements where a value falling between two graduations is rounded down to the lower value." This wording will clarify when rounding is to take place and will also eliminate the conflicting instruction.

When this procedure was added to NIST Handbook 133, the specifications of the maximum graduation sizes for the measurements were converted and rounded to a rational metric size, which may confuse users. First, the maximum ruler increments 0.5 cm ($^3/_{16}$ in or 0.1875 in) are not equivalent (0.5 cm = 0.1968 in). Second, while there are rulers and tapes available graduated in 0.5 cm and $^1/_{16}$ in there are none with $^3/_{16}$ in graduations. The current approach for specifying measurement units is confusing but can be corrected by providing separate maximum graduations for measuring instruments in metric units and inches.

In the volume calculations for firewood bundles a change of $^3/_{16}$ in (0.1875 in) in the average length will result in a 14 in^3 change in the volume of the package. To improve measurement accuracy and reduce rounding errors, it is recommended that a ruler or tape with $^1/_{16}$ in graduation be used to make measurements. The current recommend 0.5 cm graduation should be reduced because a 2 mm difference in the measurement will result in a 6 in^3 change in package volume. For metric units, a ruler or tape with 1 mm graduations is recommended. These changes are recommended to increase the accuracy of linear measurements and reduce measurement uncertainty. This is significant because several measurements are taken in verifying a single package of wood and many readings will fall between graduations and must then be rounded.

Proposed Revision:

3.14.1. Test Equipment

Linear Measurement: The maximum value of graduations on a ruler or tape shall be equal to or less than:

For SI Units – 1 millimeter (1 mm)

For U.S. Customary Units – $^1/_{16}$ inch ($^1/_{16}$ in)

Measurements shall be read to the smallest graduation on the ruler or tape. Round any value that falls between two graduations up to the higher value except when making headspace depth measurements where a value falling between two graduations is rounded down to the lower value.

D. Address Conflicting Instructions in Section 3.14.2. Test Procedures for Boxed Firewood

1. **Conflicting Instructions in Height and Width Measurement Procedures**: The instructions in the first and last part of Step 2 describe the procedure for determining the height of the stack of wood in the box through a headspace procedure. That is, the depth of the headspace is deducted from the inside height of the package. The instructions in Step 2 intentionally exclude the package height from being used to calculate the height of the wood. This differs from the procedure for measuring width described in Step 4 below.

This is the current wording in Step 2*:*

2. *"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."*

This is the current wording in Step 4:

> 4 *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.*
>
> $$Average\ Width = (W_1 + W_2 + W_3) \div 3$$

In Step 4, the first sentence reads "determine the average width of the stack of wood," but the measurement instruction reads "measure the inside distance from one side of the box to the other." This instruction can be read to mean that the measurement is of the width of the box and not the wood it contains. Also, there is no deduction for the gap between the wood and sidewall of the box as in the headspace procedure in Step 2. This instruction appears to differ from other dimensional test procedures in NIST Handbook 133 (e.g., the thickness of the wrapper is deducted from dimensions of a package of peat moss) and does not follow common legal metrology measurement practice. As Step 4 is now written, the volume formula for boxed firewood is:

$$Volume\ of\ Wood = Height\ of\ Wood \times Interior\ Width\ of\ Package$$

Recommendation: Revise Step 4 to require that the width of the wood be used in volume determinations. Currently a minimum of three measurements is required. Because the shape of firewood varies, using this small sample will result in the average value having greater variability than in the case where five or more measurements are taken. The average width of the wood should be determined using direct measurement of the stack at five or more points along the length of the stack which are then averaged. If the recommended amendments are made, the formula for firewood would be:

$$Volume\ of\ Wood = Average\ Height\ of\ Wood\ Stack \times Average\ Width\ of\ Wood\ Stack$$

Example:

> 4. *Width of Wood Stack*
>
> a. *Open the box and measure the width of the wood stack. Take at least five measurements at intervals spaced along the length of the stack. Average these values to obtain an Average Width of Wood Stack.*
>
> $$Average\ Width\ of\ Wood\ Stack = (W_1 + W_2 + W_3 + W_4 + W_5) \div 5$$

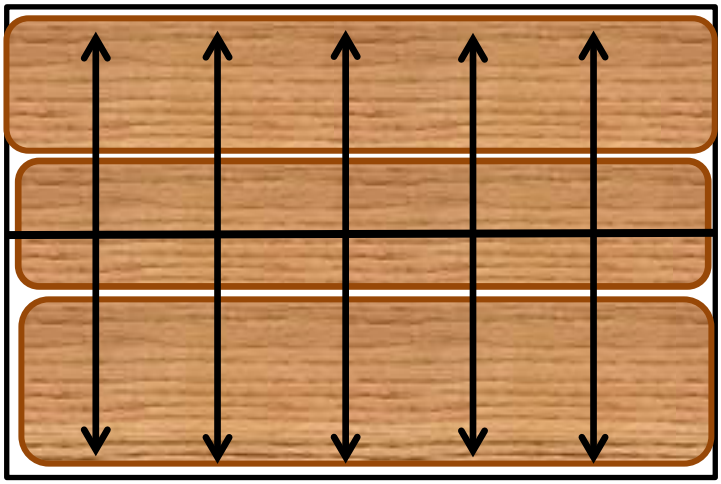


Figure 3. Determining the average width of wood stack.

2. **Rounding Clarifications:** It is currently recommended to round measurements up in favor of the packer. This is incompatible with a headspace procedure where the depth measurements must be rounded down to favor the wood packer. See **proposed revision** for Section 3.14.1**. "**Test Equipment**"** above for language clarification to eliminate the conflict. For added clarification**,** all directions regarding rounding should include a statement "or less" to indicate that rulers with increments less than those specified may be used. For example, a ruler with 1 mm graduations may also be used.

This is the current wording in Step 2*:*

Round measurements down to the nearest 0.5 cm ($^1/_8$ in).

Recommendation: Amend the guidance to read:

Round measurements down to the nearest 1 mm ($^1/_{16}$ in) ***or less.***

3. **Improving the Accuracy of Height Measurements:** The height of the stack of wood varies from box to box. This is due to the cutting or trimming of the wood that takes place in order for it to fit into the box and natural variations in the shape of the wood. Sometimes gaps large enough to hold an extra piece of wood are found in boxes, which are later found to contain the declared volume. According to inspectors experienced in using the current procedure, an optional step, based on the judgement of the inspector, allows the inspector to make additional measurements if he or she "suspects" that a piece of wood was inadvertently left out of the box or that it fell out during shipment. Since this language is vague and subject to individual judgement, it does not add to the accuracy of the test. The NCWM should consider removing this language from the procedure and instead require a minimum of five measurements be taken at as many points across the top of the firewood in every test. Taking additional measurements always reduces the variability in the average and increases accuracy. Thus, increasing the minimum number of measurements and number of points across the top of the box will improve the height determination in every test rather than for just those tests where the inspector suspects a piece is missing.

This is the current wording in Step 2*:*

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.

Recommendation: Revise Step 2 to delete optional step beginning "if pieces are obviously…") and require additional measurements at a minimum of five locations to reduce variability in the average height:

a. open the box to determine the average height of the stack of wood;

b. measure the internal height of the box; and

c. take at least five measurements spaced at intervals along each end and center of the wood stack (record as "d_1, d_2. . .etc.; take at least 15 measurements."). (See Figure 3 for an illustration of where the measurements may be taken.) Measure from the bottom of a straightedge placed across the top of the box to the highest point on the wood (round the measurements down to the nearest 0.5 cm [$^1/_8$ in] or less). Calculate the average height of the stack by averaging these measurements and subtracting the result from the internal height of the box using the following formula:

Average Height of Wood Stack =
(Internal Height of Box) − (Sum of Depth Measurements) ÷ (Number of Measurements)

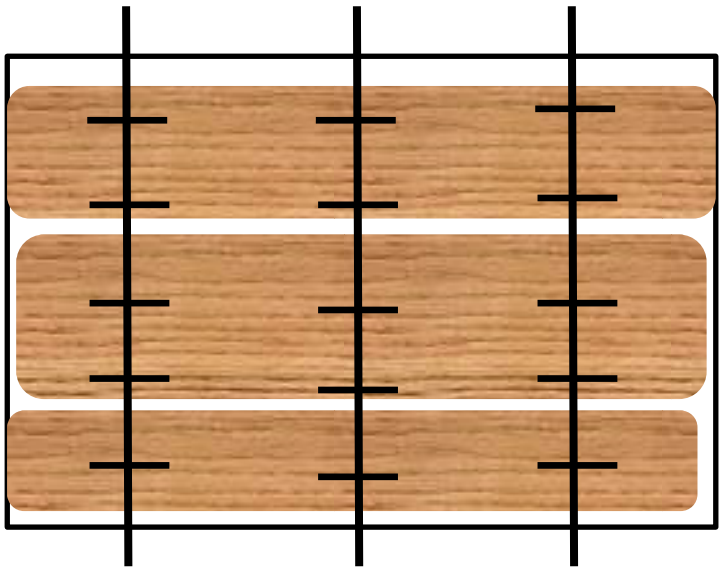


Figure 3. Top View of Box – Measurements taken at cross bars.

4. **Modify procedures in NIST Handbook 133, Section 3.14. for Measuring the Average Length:** All three procedures in NIST Handbook 133, Section 3.14. provide instruction to measure the length of the five pieces of wood with the "greatest girth." There is no explanation in the adoption history to explain this requirement. Since there is no direct relationship between girth and length, it is likely only a way to provide guidance in picking which pieces to measure. Most boxes and bundles of firewood include from 5 to 12 pieces while bags and boxes of smaller pieces can include dozens. Some stacks of firewood can include a hundred or more pieces depending on the diameter of the wood or shape. Typically, for both packaged and stacked firewood, the pieces are cut to specific lengths (e.g., 406 mm [16 in] or 457 mm [18 in] or longer) so they fit most fireplaces and are easily handled.

   The way to improve an "average" value is to increase the number of measurements. It is likely, a sample of only five pieces of wood from most packages or stacks does not result in the determination of an average length that represents the actual average length of all of the pieces in the package or stack from which it is taken. To improve measurement accuracy, it is recommended that a larger number of samples be measured to reduce the variability in the average piece length used in the volume determination. Increasing the sample size can be done without imposing tedious and often time consuming random sampling procedures if the assumption is made that the length of any piece selected for measuring is generally (but not exactly) representative of the other pieces that the packer cut or selected for inclusion in the package under inspection. Even though this recommendation increases the number of measurements the inspector is required to take, the trade-off is improved measurement accuracy and more reliable test results. In addition, the proposed change would eliminate reference to the girth of the wood.

Recommendation: Remove the instruction to "select the five pieces with the greatest girth" and instead specify a minimum number of pieces must be selected and measured, which increases with the volume of the wood measured. This table is based on, but is not identical to, the firewood test procedures of the California Division of Measurement Standards.

Table A.		
Volume		Minimum Sample of Pieces to be Measured for Length*
1.	**Packaged Firewood 453 L (16 ft^3 [1/8 cord]) or less**	
a.	For packages with 12 pieces or less	All
b.	For packages with 13 to 50 pieces	At least 12 pieces
c.	For packages with more than 50 pieces	At least 24 pieces
2.	**Stacked Wood**	At least 12 pieces for each ½ Cord or fraction thereof
*Note: While the packages of firewood to be included in the sample must be selected using the random sampling techniques described in HB 133, Section 2.3.4. "Random Sample Selection" those techniques are not used in selecting the individual pieces for measurement for length. Since the packages were selected at random, the assumption is made that the length of any piece selected for measuring is generally representative of the other pieces that the packer cut or selected for inclusion in the package under inspection. When selecting pieces of wood for measurement, take them from different locations in the package or stack so that they are representative of the other pieces available for measurement.		

a. How to Measure the Length of a Piece of Wood: There are different instructions on the method to be used to determine the length of the wood pieces in the boxed, crosshatched and bundled firewood procedures.

The boxed firewood procedure reads as follows:

> *"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."*

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

The procedures in Handbook 133, Section 3.14.2.b. "Crosshatched Firewood" and c. "Bundles and Bags of Firewood" do not include the instruction to measure "center to center."

> *"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"*

Background: The instructions to measure the length of the pieces of wood from "center to center" conflicts with other length measurement procedures in NIST Handbook 133 and good measurement practice in general. While with firewood, the pieces are typically cut and split to predetermined approximate lengths (e.g., 406 mm [16 in] or 457 mm [18 in] or longer), the angles of the end cuts, shapes of the pieces, and actual lengths vary significantly (e.g., up to 50 mm [2 in] in samples tested at NIST) within the same package. Variations in the lengths of individual pieces can also be significant depending where (i.e., point to point) the measurements of the piece length are taken. Figure 4 shows six pieces of wood from the same bundle with irregular lengths and Figure 5 shows a bundle with pieces with substantial variations in length.

Figure 4. **Irregular Lengths from a Bundle.**

Figure 5. Other Examples of Irregular Lengths

The "length" of a piece of wood is affected by its shape and the angle or irregularity of the cuts of its ends. Some interpret the instruction to measure "center to center" as meaning the measurements are to be taken along the centerline of the piece of wood (see Figure 6). Others read it as meaning the centerline between the two most distant points on the piece of wood. As Figure 6 shows, this could result in a significant difference in the length of a piece. One plausible explanation for the adoption of the "center-to-center" instruction is that it was one quick way to obtain the "average" length on pieces with the ends cut at sharp angle but there is no historical explanation.

Figure 6. "Center-to-Center" Measurement.

At a recent training event nine experienced inspectors measured six pieces of wood according to the "center-to-center" measurement instructions using a rigid ruler with 1 mm graduations. The range of measurement results are shown in Table 1. "Variations in the Measurement of Six Pieces of Wood from a Bundle 'Center to Center' in Millimeters" below. The variations in the length measurements for the same pieces (i.e., A and B) were from 4 mm (0.15 in) to 14 mm (0.55 in). It is probable that no two pieces of firewood are identical in shape, end cut or length. In practical terms then, this small exercise shows that the current instruction does not provide sufficient guidance on measuring irregular pieces of wood so that their "length" can be accurately determined for use in a volume calculation.

Table 1. Variations in the Measurement of Six Pieces of Wood from a Bundle "Center to Center" in Millimeters

Wood Piece	Inspector									Range in mm	Range in inches
	1	2	3	4	5	6	7	8	9		
A	502.0	497.0	511.0	502.5	504.5	509.0	502.0	502.0	505.0	14.0	0.55
B	527.0	*	528.0	529.0	525.5	527.0	526.0	527.0	525.0	4.0	0.15
C	*	*	551.0	*	549.5	551.0	543.0	548.0	550.0	8.0	0.30
D	348.0	344.0	345.0	341.5	344.0	345.5	345.0	340.0	350.0	10.0	0.39
E	445.0	449.0	445.0	445.5	445.0	442.5	450.0	442.0	438.0	12.0	0.47
F	360.0	360.0	359.0	358.0	365.5	358.0	363.0	362.0	361.9	7.5	0.29
*measurement omitted.											

The taking of just one measurement on an irregularly shaped piece of wood to determine its length contrasts sharply with the test procedures for other products such as polyethylene sheeting and paper towels sold by length, width, and thickness. For these products, NIST Handbook 133 requires at least three measurements along each dimension. The significant difference between the products is that in polyethylene sheeting and paper products, the variations are industrially controlled to be within a few micrometers or mils (0.001 in).

Recommendation: The length of a uniformly cut piece of wood can be determined with just one measurement along the centerline of its longitudinal axis. Examples of the recommended procedure for determining the length of a uniformly shaped piece of wood are shown in Table 2a. "Determining Piece Length – Uniform Shapes." This table will be included in Appendix A. "Proposed Revisions to the Firewood Test Procedures in Section 3.14."

Table 2a. Determining Piece Length – Uniform Shapes

Uniform Shapes
Errors in the length measurement can result in a significant volume errors especially with the small quantities typical of packaged wood. When the pieces are generally cut in a uniform manner a single measurement along the centerline of the logitudinal axis is used to determine piece length. Take the measurement along a straight line between two points over solid wood.

(i) Most wood pieces are cut perpendicular to their longitudinal axis so one measurement taken from the face of one end to the face of the other end will provide an accurate length determination.

(ii) On pieces of wood with "reverse bias" and "bias" end cuts estimate where the centerline of the piece is and then measure to these points as shown below. The intent of this measurement is to determine an "average" length that is assumed to fall along the centerline of the piece. The top piece is an example of a "reverse" bias cut.

The bottom piece is an example of a bias cut

For pieces of wood with irregular ends or shapes, determine the length of the wood using an averaging procedure based on at least three point-to-point measurements. The three measurements may be taken along one or more surfaces of the piece of wood (e.g., split pieces may have multiple sides) between two points that visually cross solid wood at the (1) shortest, (2) the longest, and (3) along the centerline of the piece. Additional measurements may be taken at other positions along the same axis as the original measurements to obtain values that are representative of the variations in the length of the piece.

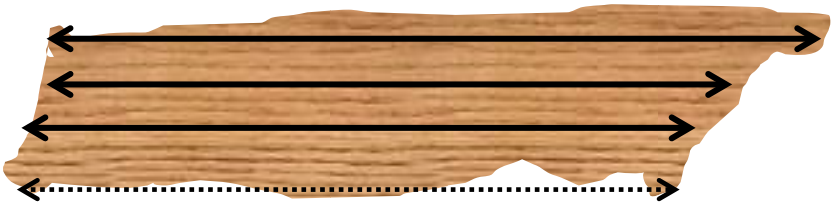
Examples of the recommended procedure for determining the length of an irregularly shaped piece of wood are shown in Table 2b. "Determining Piece Length – Irregular Shapes." This table will be included in Appendix A. "Proposed Revisions to the Firewood Test Procedures in Section 3.14."

Table 2b. Determining Piece Length – Irregular Shapes

Irregular Shapes

When the pieces have irregular shapes, cuts, or shattered ends, it is necessary to take at least three measurements and average the results to obtain the length of the piece. Take the measurements along a straight line between two points that cover solid wood and appear to be the shortest and longest dimensions and a third measurrement at or near the centerline of the piece.

(i) This piece has a bias cut end on the left and an irregular end on the right. The measurements are taken at the longest and shortest points where the line crosses over solid wood. The lowest measurement (dotted line over the air space) is not used because it does not cross wood. Only the three upper measurements are used to calculate the average length for this piece unless additional measurements across solid wood are taken.



(ii) This is a piece with a bias cut on the left and an irregular end on the right. Note how the measurements are taken at the longest and shortest points where the line crosses over solid wood. The lowest measurement (the dotted line) would not be used because it does not cross over wood.

(iii) This piece of wood has a "shattered end." Shattering occurs when wood is stressed beyond its breaking point and the end is not trimmed. The inspector should take additonal measurements to account for the shortest point of the voids and longest points at the extensions. In this example, five measurements were taken and averaged to account for the voids and extensions.

To calculate the volume of the package, an Average Piece Length (APL) representing all of the pieces in the package is determined. To obtain the APL, the individual pieces are measured, and their average lengths are determined using the average of three measurements as illustrated below. Those average values are summed and divided by the number of pieces in the package.

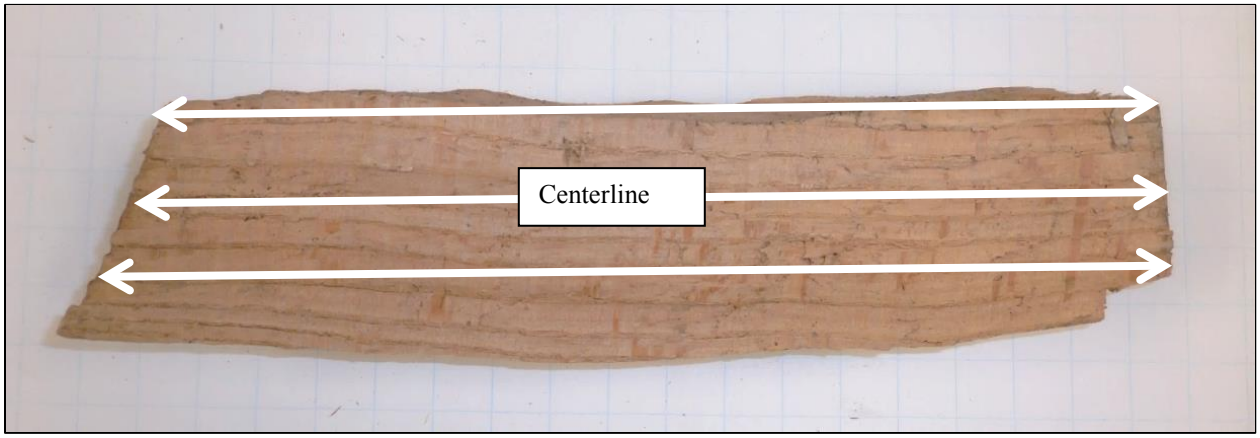
The first step in determining the Average Piece Length is to determine the Individual Piece Length:

7. **Individual Piece Length.** – Remove the wood from the package and measure the length of each piece of wood (see Table A on page 13 for the number of pieces to measure.) Determine the length of a piece of wood by taking at least three point-to-point measurements. Take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions and a third at or near the centerline of the piece. Calculate the average of the measurements to obtain the Average Individual Piece Length.

$$Average\ Individual\ Piece\ Length\ (AIPL) = (L_1 + L_2 + L_3) \div 3$$

The arrows in Figure 7. "Three Point Measurement" illustrate where the measurements were taken on the pictured piece. The actual dimensions of the piece are shown in the table shown below the figure in Table 2b. "Determining Piece Length – Irregular Shape."

Figure 7. "Three-Point" Measurement.



Piece	L_1	L_2	L_3	Average Individual Piece Length
Figure 7	*350 mm*	*378 mm*	*395 mm*	*374.3 mm*

The next step is to measure the remaining pieces of wood, sum the results, and then divide by the number of pieces in the sample.

2. **Average Piece Length.** – *After the Average Individual Piece Lengths are determined, sum the values, and divide by the number of pieces measured to obtain the Average Piece Length for the package.*

$$Average\ Piece\ Length = (AIPL_1 + AIPL_2 + AIPL_3) \div 3$$

If the recommended changes in Table A are adopted, all of the pieces of wood in a box or bundle will typically be measured; providing increased accuracy over the current procedure.

Example: The three pieces of firewood in Figure 8. "Three Pieces Measured from One Bundle" represent those recently found in a package of firewood sold locally. Each piece is measured using the Individual Piece Procedure in Step 1. "Individual Piece Length." Those lengths are then summed and divided by three to obtain the Average Piece Length for use in determining the volume of wood in the package.

Note: L_2 would be the length used under the current measurement method.

Figure 8. Three Pieces Measured from One Bundle.

Piece	L_1	L_2	L_3	Average Individual Piece Length
A	*410 mm*	*450 mm*	*458 mm*	*439*
B	*350 mm*	*378 mm*	*395 mm*	*374*
C	*542 mm*	*547 mm*	*550 mm*	*546*
		Total Piece Length		*1359*
		Average Piece Length		*453 mm*

3. **Clarify Area Measurements for Bundles and Bags –** The current procedure in Section D. "Address Conflicting Instructions in Height and Width Measurement Procedures" for determining the volume of the firewood in bundles and bags is shown below with comments:

    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.

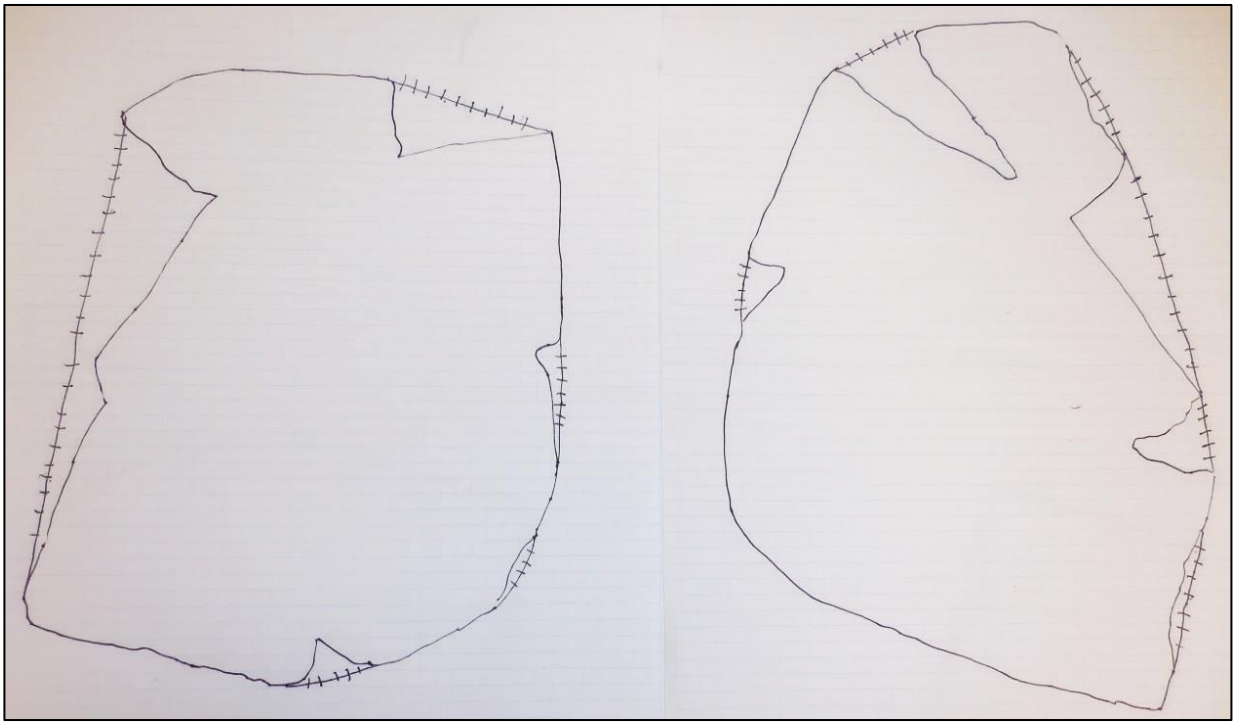
Comment: The first sentence has been misinterpreted and two completely different approaches to measuring the area of the ends of the bundle of wood have been used. At least one court case has taken place where its meaning has been extensively argued.

One interpretation of the first sentence is that a "definite" perimeter around the wood is created by securing the strap around the bundle to hold the pieces firmly in place. Using this interpretation, the area of each end is determined by tracing the outline created by the wood onto graph paper (e.g., 1 in squares) and this tracing excludes accessible air gaps between the pieces. The area of each end of the bundle within the perimeter line is then determined by counting the whole squares and rounding the partial squares to the nearest ¼ in^2. Those two values are averaged and multiplied times the average length of the five biggest pieces to calculate the volume of

wood in the package. At least three states, which actively test firewood, report they apply this interpretation in their testing.

The second interpretation of the first sentence is that the "definite" perimeter of the bundle is defined by tracing the outside of the straps which are to be placed at the extreme end of the bundle so that the accessible air gaps are included in the area. The graphic in Figure 9 show the areas of a bundle traced on quarter-inch graph paper using both interpretations. The cross-lines (+) indicate the air gaps as defined by drawing the line around the outside perimeter of the strapping. For this example, the strapping used was fiber packing tape with a thickness of 0.006 inch.

Figure 9. Illustration of the Areas of the Ends of a Bundle of Firewood Using Both Methods.



A – End of Bundle **B – End of Bundle**

Defining the Perimeter

Straps for Securing the Wood and Defining Perimeter

The original submitter of the proposal for the firewood procedures, currently in NIST Handbook 133, recently confirmed that they use the perimeter of the bundle defined by tracing a line around the outside perimeter of the strap (the second interpretation) to verify the volume of wood in a bundle, and that was the original intent of the proposal submitted to the NCWM.

One cause of these conflicting interpretations appears to be that the test procedure lacks detailed instructions and background information, which would explain the purpose of the straps and provide specific instructions on where they are to be placed on the bundle. In reading the test procedure, the purpose of using the straps appears to be solely to hold the wood securely in place so its shape can be traced. There is nothing to indicate that their outside perimeter is to be used. The

graphic accompanying the current text, where the strapping is towards the center of the bundles, further confuses the reader.

Bags

In verifying the volume contained in bags, it is difficult to obtain the accurate area measurements of the ends of the packaging or piece length because of the interference of the bag. (See Figure 10.) For these reasons, the proposed test procedure requires bagged firewood be removed from the packaging and formed into a bundle for testing.

Figure 10. Bagged Firewood 0.75 ft^3 (21 L).

Strap Thickness

If the outside perimeter of the strap is used to define area, the thickness of the straps increases the area measurement. If it is determined the outside perimeter of the strap is to be used for the determination of the area of the end of a bundle, a thickness specification must be added to the procedure to ensure that packers use the same strap thickness as inspectors to avoid disputes.

Here are some examples to illustrate potential measurement error introduced by the use of the straps, (assuming the bundle has a 10 in diameter)[8]. If the perimeter is drawn around the outside of a 1/16 in thick strap, it will add 1.9 in^3 to the package volume. A ¼ in strap would add up to 7.8 in^3 to the package volume. The error increases if the method to secure the strap requires overlapping along some length of the perimeter.

Some limited testing was done using very thin Velcro strapping and duct tape. The problem with the Velcro strapping is that it typically must be doubled over to secure it resulting in expanding the perimeter artificially, thus, increasing the measured area. Duct tape deformed too easily over the air gaps and would not hold the wood securely. The substitute used in this testing was fiber reinforced packing tape (thickness 0.006 in). It performed better than duct tape in securing the wood; it did not deflect when the tracing was done over the air gaps. No deduction was made for the volume error due to the thickness of the fiber tape, which was calculated to be about 0.18 in^3.[6]

[8] The volume of a strap is determined using the formula: *Volume* = *L* × *W* × *Thickness*. The circumference is determined using the formula: *Circumference* = 2 × π × *r*. Assuming a bundle has the diameter of 10 in, its radius will be 5 in. Using the formula 2 × 3.1415 × 5 the circumference of the bundle is 31.4 in. Assume the width of the strap is 1 in. For instance, if the thickness is 0.006 in then 31.4 × 1 × 0.006 = 0.18 in. If the thickness is 1/16 in, then 31.4 × 1 × 0.0625 = 1.9 in^3. If thickness is 1/8 in, then 31.4 × 1 × 0.125 = 3.9 in^3. If the strap thickness is 1/4 in, then 31.4 × 1 × 0.25 = 7.8 in^3.

Using Shrink Wrap Packaging to Define the Perimeter is Unreliable

Another suggested approach for defining the perimeter of firewood, has been to use the perimeter as defined by the shrink wrapping on the packages. This packaging, which sometimes wraps around the ends of bundles, was on the bundles tested in this study; the least accurate method for defining the perimeter. On most of the bundles tested in this study, the wrapping is too loose to hold a distinct shape or the heating process melted the plastic and created thick masses that would increase the perimeter measurement artificially. All bundles of firewood should be subject to the same test procedure, and their perimeters should be defined consistently so one type of packaging does not give the packer an advantage over another.

Variations in Area Determinations

The difference in the average area obtained between the two interpretations results in substantive differences in the calculated volume of the wood.

In limited testing with four bundles (see Figure 11) of wood, each from a different packer, it was found that using the outside perimeter defined by the strap (here the 0.006 in fiber tape was used to trace this perimeter), by including the air gaps, increased the area of a bundle from 4 in^2 to 7 in^2 over the perimeter defined by the wood.

Figure 11. Test Bundles.

An alternative method of area determination using the circumference of the bundle to obtain the area of the bundle ends was submitted by a firewood packer (see Appendix D. “Industry Proposal” on page 51) as a possible alternative to using graph paper in determining the area of the bundle ends (the proposal is called the circumference method).[9]

Limited testing found the circumference method overestimated the area of the bundle ends up to 18 in^2 over the area determined using the perimeter defined by the wood, and overestimated the area up to 10 in^2 over the area determined using the perimeter defined by the outside of the strap.

For comparison purposes, three approaches were used to determine the volume of each of the bundles. Minor changes in the test procedure were made to carry out these tests. The first approach was to use graph paper with quarter-inch squares instead of one-inch squares. This reduced rounding errors and provided a more precise determination of area. The second approach was to use fiber reinforced packing tape as strapping to define the perimeter using that method.

[9] Circumference Method. – Measure the circumference of both ends of the firewood bundle and average the result. The area is calculated using the formula $Area = \pi R^2$ where $R = C/2\pi$ and $\pi = 3.1415$ and $C = Average\ Circumference$. The volume of the bundle is determined by multiplying *Area* by the average length of the pieces of wood in the package. Here, to control variations caused by length deviations all comparisons were done using a uniform piece length of 16 in.

Table 1. Area Determinations			
Bundle	**Average Area Perimeter Around Wood**	**Average Area Perimeter Around Outside of Strap**	**Average Area Circumference**
1	71.87 in^2	79.21 in^2	89.3 in^2
2	65.56 in^2	69.03 in^2	80.9 in^2
3	61.49 in^2	68.56 in^2	78.4 in^2
4	55.81 in^2	61.75 in^2	72.2 in^2

The cause of the differences in area between the two perimeter determination methods is obvious since most of the air gaps are excluded when the perimeter is defined by the wood; whereas, when the perimeter is defined by the outside of the strapping, they are not. The significant increase in area found using the circumference method is also understandable. The overestimation of the areas by the circumference method is that Pi is used in calculating the area. Pi, by definition, means the exact ratio of the circumference of a circle to its diameter. Most of the bundles of firewood tested had irregularly shaped ends loosely closer to resembling polygons or rectangles than circles so the ratio between circumference and diameter is not exact. Because the formula used in the circumference method is accurate only when the circumference of the bundle is a true geometric shape (i.e., circle), it should not be accepted as a replacement for the original test procedure (see Figure 12 for examples).

Could it be used as a Field Auditing Tool?

Even though the circumference method is not a suitable replacement for the current test method, it could serve as a screening procedure (the circumference procedure takes only a few minutes to complete for each bundle and the calculations are easy to complete), which could be used in the field to screen lots of packaged firewood to identify potentially short measure packages. Information on the potential difference between the two methods would have to be collected, but it appears that it could be a worthwhile endeavor. It would require the collection of test data comparing the results of the two methods. If developed and used in the field, an inspector could identify a lot and collect a random sample and use the circumference method to estimate their volume. Based on those tentative results, he or she could decide to treat the check as an audit or go on to perform a full test on the sample using the reference test method. An "audit" test based on dimensional testing and calculation is described in NIST Handbook 133, Section 3.7. "Volumetric Procedure for Paint…" for use in auditing containers of paint to determine if they should be tested volumetrically. The compliance test procedure for paint, like packaged firewood, is also destructive and time consuming. In the proposed revision of the test procedure presented in Appendix A, the circumference method for area determination is included for use as an auditing tool to save inspection resources. Before it is used extensively, additional comparisons against the reference method for volume must be made.

Reference Test Procedure

The current test procedure using graph paper to determine area, though time consuming, provides accurate and repeatable results. It should be considered as the reference procedure once it is determined how the perimeter of the bundle is to be defined.

Figure 12. Circles Show Calculated Areas are larger than Actual Areas because Calculations are Based on Pi.

Variations in Volume Determinations

To ensure the volumes were not affected by the variation in lengths of the pieces, all volume calculations were made with the fixed length of 16 in using the average area determined for each bundle. This isolated the area determination procedure for comparison purposes.

Comparison of Volume Test Results

The primary reason for this review was to develop information to assist with the interpretation of the procedure used in NIST Handbook 133, Section 3.14.2.c. Bundles and Bags of Firewood, and specifically to determine the average area of the ends of a package under test. When the area is determined using the perimeter of the wood to define the area, a lower volume is obtained than when the strap is used to define the perimeter. However, as the data shows, the difference between the two methods of determining perimeter ranges from 69 in^3 to 121 in^3. The circumference method consistently overestimated the volume of both of the perimeter methods by 150 in^3 to 250 in^3 or more. The recommendation from NIST is that the NCWM Laws and Regulations Committee utilize this limited test data along with a display of firewood bundles showing how the two perimeter methods are used to determine the areas so an informed decision is made about which approach should be adopted for use in NIST Handbook 133.

Volumes in Cubic Inches							
Bundle	**Labeled Volume**	**A. Volume Wood Area**	**B. Volume Strap Area**	**B − A =**	**C. Volume Circumference Area**	**C − A =**	**C − B =**
In Cubic Inches – (1728 in^3 = 1 ft^3 or 0.75 ft^3 = 1296 in^3 or 0.7 ft^3 = 1209.6 ft^3							
1	0.70 cu ft	1140	1261	121	1434	294	173
2	0.75 cu ft	1037	1106	69	1296	259	190
3	0.75 cu ft	985	1089	104	1261	276	172
4	0.75 cu ft	881	985	104	1158	277	173

The results obtained using all three test procedures are shown in the table below:

Volumes in Cubic Feet				
Bundle	**Labeled Volume**	**Volume Wood Area**	**Volume Strap Area**	**Volume Circumference Area**
1	0.7 cu ft	0.66 cu ft	0.73 cu ft	0.83 cu ft
2	0.75 cu ft	0.60 cu ft	0.64 cu ft	0.75 cu ft
3	0.75 cu ft	0.57 cu ft	0.63 cu ft	0.73 cu ft
4	0.75 cu ft	0.51 cu ft	0.57 cu ft	u ft

E. Stacked "Cross hatched" Firewood

The current test procedure in NIST Handbook 133, Section 3.14.2.b. for "crosshatched wood" (the term "stacked firewood" would provide a more accurate description) includes the minimum amount of guidance on how to determine the volume of stacked firewood. The California Division of Measurement Standards test procedures include explanatory graphics and additional instructions that, if added to NIST Handbook 133, would improve the accuracy and repeatability of the procedure.

The only significant technical change needed is in the procedure for determining the width of the stack where it calls on the inspector to select just five pieces with the "greatest girth" to be measured for length. Most inspectors who test firewood deliveries report that they usually measure 20 or more pieces in a stack to obtain a representative sample of length.

Additional steps and other recommendations to improve the "stacked" wood test procedure are presented in Appendix A.

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Appendix A.
Proposed Changes to NIST Handbook 133 (2015), Section 3.14. Firewood

Strikethroughs and underlining are not used because the procedures have been extensively revised. This proposal should be read in its entirety and considered as a possible replacement for the current text in NIST Handbook 133, "Check the Net Contents of Packaged Goods."

3.14. Firewood – Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less and Stacked Firewood sold by the Cord or Fractions of a Cord.

Unless otherwise indicated, take all measurements without rearranging the wood or removing it from the package. However, 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 according to the procedures described in this section. For boxed firewood, it is the volume of the wood in the box that is determined and not the volume of the box.

3.14.1. Test Equipment

- Linear Measurement: The maximum value of graduations on a ruler or tape shall be equal to or less than:
- For testing packaged firewood: SI Units - 1 mm or for U.S. Customary Units – 1/16 in (0.0625 in)
- For testing stacked firewood: SI Units – 0.5 cm or for U.S. Customary Units – 1/8 in (0.125 in)

Other Equipment:

Except where a long tape measure is needed for measuring stacks of wood and unless otherwise noted below, a precision tempered steel ruler should be used for linear measurements. Current calibration certificates issued by a NIST recognized or accredited laboratory should be available for all measuring devices.

- To test boxes of firewood, use a straightedge and a 150 mm (6 in) tempered steel pocket ruler to measure the box headspace. A rigid 610 mm (24 in) tempered steel ruler is required to measure piece length and the dimensions of the box.
- To test bundles of firewood, use a rigid 610 mm (24 in) tempered steel ruler to measure typical piece length. If the circumference based auditing method is to be conducted, a precision 610 mm (24 in) diameter (pi) tape or flexible steel tape with 1 mm (1/16 in) graduations may be used to approximate the package volume for screening and audit purposes.

For testing stacks of firewood, a precision tape or long tape measure are used. For testing bundles and bags of firewood, the following equipment and materials are used in addition to the linear measures listed above:

- Binding Straps – Straps with ratchet type closures are easily tightened to secure the wood tightly. The binding straps are used to hold wood bundles together if the bundles need to be removed from the package/wrapping material.
- Graph Paper – 279.4 mm × 431.8 mm (11 in × 17 in) with 0.5 centimeter or ¼ inch squares and a 300 mm (12 in) ruler. This paper is used for tracing and calculating the areas of the ends of a bundle of firewood. Prior to using any graph paper use a calibrated ruler to verify the dimensions of squares at several random points across the page.
- Ruler – 300 mm (12 in) with 0.5 cm (1/4 in). This ruler is used with the graph paper to calculate the area of the bundle ends.

- If the strapping method is adopted to define the perimeter of a bundle, the following item must be included in the equipment list.
    - Fiber reinforced packing tape or equivalent (typical dimensions: width – 25.4 mm [1 in]; thickness 152 µm [0.006 in]; length 54.8 m [60 yd]). This tape is wrapped around each end of a bundle of firewood for use in defining the perimeter of the bundle. It is securely tightened around the wood and a line is traced along the outside of the tape. Thicker tape should not be used as it will increase the area that is outlined around the bundle unless the volume of the strap or tape (see note) is calculated and deducted from the volume of the bundle.

Note: The volume of a strap or length of tape is calculated using the formula from Section 4.5 "Polyethylene Sheeting." That section which also provides information on the equipment and test procedure for determining thickness using deadweight dial micrometer if the thickness of the strap is unknown:

$$Volume = (Length \times Width \times Thickness)$$

3.14.2. Test Procedures

General Instructions

1. When testing packaged firewood follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. Measurements shall be read to the smallest graduation on the ruler or tape. Round any value that falls between two graduations up to the higher value except when making headspace depth measurements in the test procedure for boxes where a value falling between two graduations is rounded down.

3. Samples for Length – Use Table 3-5. "Minimum Number of Pieces to be Measured for Length" to determine the minimum number of pieces to measure to determine the average length of the firewood pieces in a package or stack.

Table 3-5.
Minimum Number of Pieces to be Measured for Length

	Volume	Minimum Number of Pieces to be Measured for Length*
1.	**Packaged Firewood 453 L (16 cu ft) [1/8 Cord] or less**	
a.	For packages with 12 pieces or less	All
b.	For packages with 13 to 50 pieces	At least 12 pieces
c.	For packages with more than 50 pieces	At least 24 pieces
2.	**Stacked Wood**	At least 12 pieces for each ½ Cord or fraction thereof

***Note:** While the packages of firewood to be included in the sample must be selected using the random sampling techniques described in NIST Handbook133, Section 2.3.4. "Random Sample Selection" those techniques are not used in selecting the individual pieces for measurement of length. Since the packages were selected at random the assumption is made that the length of any piece selected for measuring is generally representative of the other pieces that the packer cut or selected for inclusion in the package under inspection. When selecting pieces of wood for measurement, take them from different locations in the package or stack so they are representative of the total amount of wood under test.

4. Measuring Procedures for Length. – Use the instructions and graphics in Table 3-6a. "Determining Piece

Length Uniform Shapes" and Table 3-6b. "Determining Piece Length Irregular Shapes" when measuring the length of pieces to determine the average length of a piece of firewood based on its shape in a package or stack. If a piece of wood does not appear to fall within the examples shown, measure it as if it were an irregular shape, take three or more measurements, and average them.

Table 3-6a.
Determining Piece Length – Uniform Shapes

Uniform Shapes

Errors in the length measurement can result in a significant volume errors especially with the small quantities typical of packaged wood. When the pieces are generally cut in a uniform manner a single measurement along the centerline of the logitudinal axis is used to determine piece length. Take the measurement along a straight line between two points over solid wood.

(i) Most wood pieces are cut perpendicular to their longitudinal axis so one measurement taken from the face of one end to the face of the other end will provide an accurate length determination.

(ii) On pieces of wood with "reverse bias" and "bias" end cuts estimate where the centerline of the piece is and then measure to these points as shown below. The intent of this measurement is determine an "average" length that is assumed to fall along the centerline of the piece. The top piece is an example of a "reverse" bias cut.

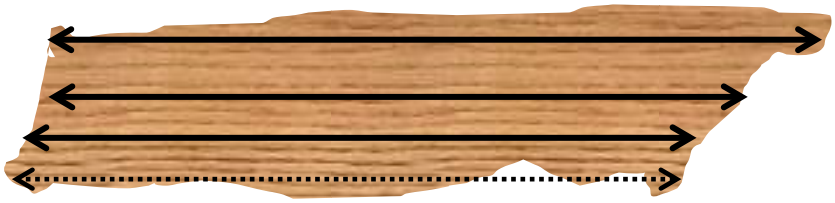
The bottom piece is an example of a bias cut

Table 3-6b.
Determining Piece Length – Irregular Shapes

Irregular Shapes

When the pieces have irregular shapes, cuts or shattered ends it is necessary to take at least three measurements and average the results to obtain the length of the piece. Take the measurements along a straight line between two points that cover solid wood and appear to be the shortest and longest dimensions and a third measurement at or near the centerline of the piece.

(i) This is piece has a bias cut end on the left and an irregular end on the right. The measurements are taken at at the longest and shortest points where the line crosses over solid wood. The lowest measurement (dotted line over the air space) is not used because it does not cross wood. Only the three upper measurements are used to calculate the average length for this piece unless additional measurements across solid wood are taken.



(ii) This is a piece with a bias cut on the left and irregular end on the right. Note how the measurements are taken at the longest and shortest points where the line crosses over solid wood. The lowest measurement (the dotted line) would not be used because it does not crossover wood.

(iii) This piece of wood has a "shattered end." Shattering occurs when wood is stressed beyond its breaking point and the end is not trimmed. The inspector will take additonal measurements to account at the shortest point of the voids and longest points at the extensions. In this example, five measurements were taken and averaged to account for the voids and extensions.

a. Boxed Firewood

Note: A packer may place wrapped bundles of firewood in boxes for ease of handling as well as for display on retail store shelves. When a box contains a bundle of wrapped firewood the volume of the bundle is verified using the test procedure in c. for bundles and bags.

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. Open the box to determine the average height of the stack of wood.

3. Measure the internal height of the box.

Figure 1. Measuring the Inside Height of Box.

- Take at least five measurements spaced at intervals along each end and center of the wood stack (record as "d_1, d_2. . .etc. Take at least 15 measurements). (See Figure 1. "Measuring the Inside Height of Box" for an illustration as to where the measurements may be taken.) Measure from the bottom of a straightedge placed across the top of the box to the highest point on the wood (round the measurements down to the nearest 0.5 cm [1/8 in] or less). Calculate the average height of the stack by averaging these measurements and subtracting the result from the internal height of the box using the following formula:

$$\textit{Average Height of Wood Stack} =$$

$$\textit{(Internal Height of Box)} - \textit{(Sum of Depth Measurements} \div \textit{Number of Measurements)}$$

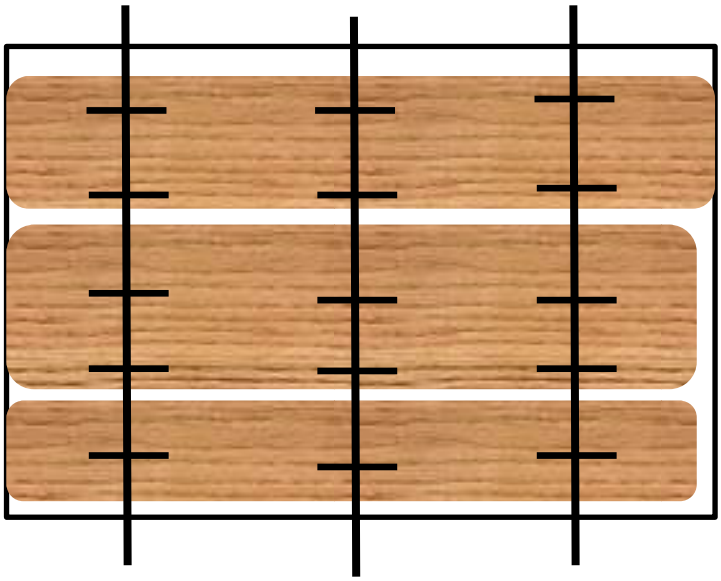
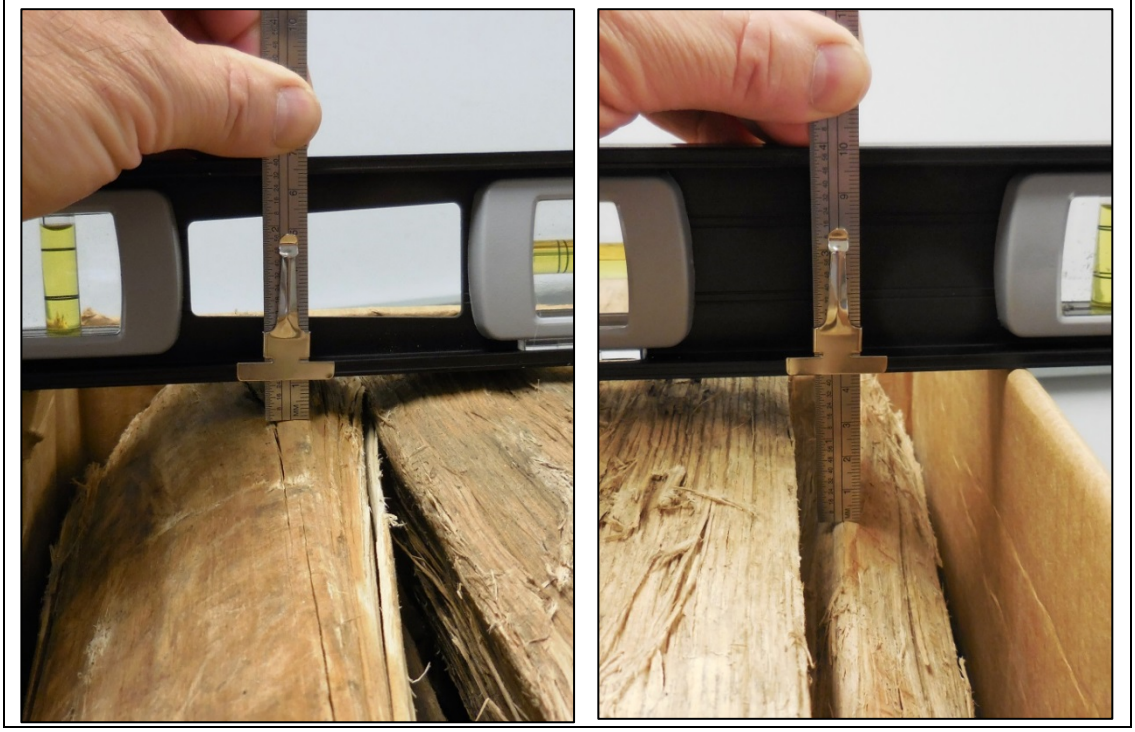


Figure 2a. Top View of Box – Measure at cross bars.

Figure 2b. Examples of the Headspace Measurement.



4. Width of Wood Stack. – Open the box and measure the width of the wood stack. Take at least five measurements at intervals spaced along the length of the stack. Average these values to obtain an Average Width of the Wood Stack.

$$Average\ Width\ of\ Wood\ Stack = (W_1 + W_2 + W_3 + W_4 + W_5) \div 5$$

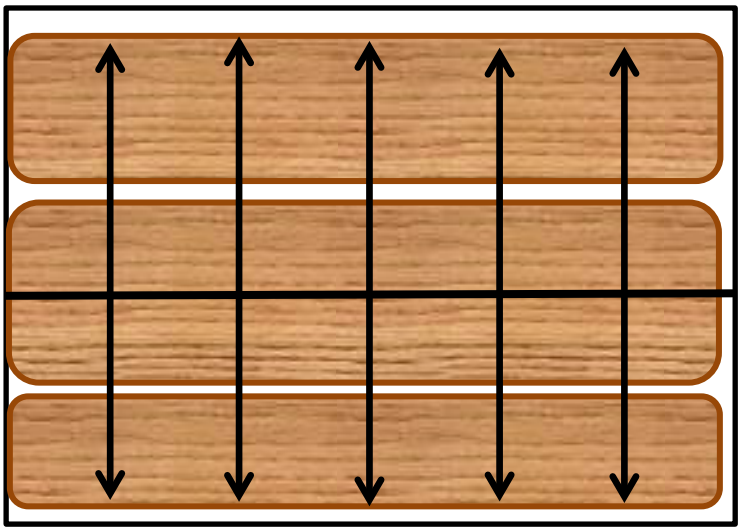


Figure 3a. Top View of Box – Measure at Crosslines.

Figure 3b. Measuring the Width of the Firewood in a Box.

5. Individual Piece Length. – Remove the wood from the package and measure the length of each piece of wood. (See Table 3-5. "Minimum Number of Pieces to be Measured for Length.") If the piece of wood is uniform in shape, take at least one point-to-point measurement along the centerline of the longitudinal axis (see Table 2. "Determining Piece Length – (a) Uniform Shapes" for examples) and record the value.

   If the wood is irregularly shaped (see Table 3-6b. "Determining Piece Length – Irregular Shapes"), for examples, take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a third at or near the centerline of the piece. Calculate the average of the measurements to obtain the Average Individual Piece Length and record the length of the piece.

   To determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:

   $$AIPL = (L_1 + L_2 + L_3) \div 3$$

   After all pieces are measured, total the lengths and divide that total by the number of samples to obtain the Average Piece Length for the package.

To determine Average Piece Length (APL) for the package:

$$APL = (L_1 + L_2 + L_3 + \ldots L_n) \div (\text{Number of Pieces in Sample})$$

6. Use the average values for height, width, and length to calculate the volume of wood in the box.

$$\text{Volume in liters} = (\text{height in mm} \times \text{width in mm} \times \text{length in mm}) \div 1{,}000{,}000$$

$$\text{Volume in cubic feet} = (\text{height in inches} \times \text{width in inches} \times \text{length in inches}) \div 1728$$

7. 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 Steps 1, 2, and 3 above for each discrete section, compute the 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 VR_1 and V_2. Compute total volume by adding V_1 and V_2 according to the following formula.

$$\text{Total Volume} = V_1 + V_2$$

Note: 1 Cubic Foot = 1728 Cubic Inches

b. Stacked Firewood

Bulk deliveries of firewood are typically required by law or regulation to be on the basis of cord measurement. The "cord" is defined as the amount of wood contained in a space of 128 ft^3 when the wood is ranked and well stowed. The standard dimensions for a cord of wood are 4 ft × 4 ft × 8 ft but wood may be stacked and measured any configuration. See Figure 4. for an illustration of how a cord may be stacked.

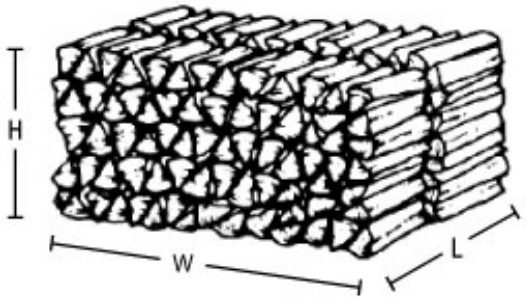


Figure 4. A Cord is 4 ft (Height) × 4 ft (Width) × 8 ft (Length).

- Wood delivered to a consumer: if a delivery ticket or sales receipt is available (these are often required by state regulation) review the delivery ticket or sales receipt and determine the quantity delivered. Identify the wood to be measured and verify that the wood delivered was not mixed with wood that was already present at the location. Also, determine if the delivery was partial or complete (i.e., no additional deliveries are expected) and if any of the delivered wood has been used.

- If necessary stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular). Any voids that will accommodate a piece of wood in the stack shall be deducted from the measured volume.

Note: The length measurements of the individual pieces may be made during the stacking process.

- Determine the average measurements of the stack: the number of measurements for each dimension given below is the minimum that should be taken.

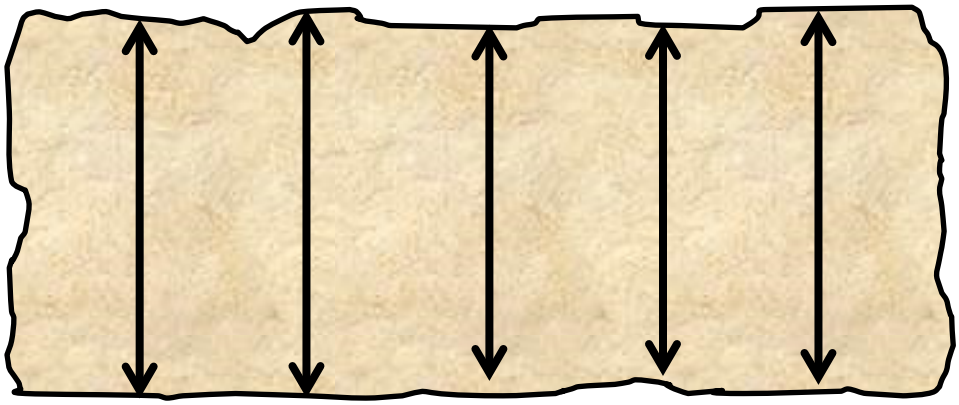
1. Height of Stack: A height measurement is the vertical distance between the top edge of a piece of wood in the top row and the bottom edge of a piece of wood on the bottom row. Start at one end of the front of the stack; measure the height of the stack at five equally spaced intervals (e.g., approximately 18 in to 24 in) along the length of stack. If the length of the stack is over 10 ft, take additional height measurements at equally spaced intervals along its length. If the height of the stack varies significantly (e.g., the pieces are stacked in peaks along the length of the stack) take additional height measurements. Calculate and record the average height for the front of the stack. Repeat the same height measurement procedure along the back of the stack and then calculate and record the average height for the back of the stack. Calculate the average height of the stack by averaging the two results. If the wood to be measured is stacked on a slope, take the height measurements at right angles to the slope.

$$Average\ Height_{Front} = (h_1 + h_2 + h_3 + h_4 + h_5) \div 5$$

$$Average\ Height_{Back} = (h_1 + h_2 + h_3 + h_4 + h_5) \div 5$$

$$Average\ Height\ of\ Stack = Average\ Height_{Front} + Average\ Height_{Back} \div 2$$

Figure 5. Average Height Measurement (front and back).



2. Length of Stack**:** A length measurement is the horizontal distance between the left edge of a piece of wood on the left side of the stack and the right edge of a piece of wood on the opposite side of the stack. Start at either side of the stack; Measure the length of the stack in five equal intervals. Calculate and record the average length. If the length of the stack varies significantly (e.g., the ends of the stack bulge out along the height of the stack), take additional measurements.

Figure 6. Average Length Measurement (front and back).

Calculate and record the average length for the front of the stack. Repeat the length measurement procedure along the back of the stack and then calculate and record the average length for the stack.

$$Average\ Stack\ Length_{Front} = (l_1 + l_2 + l_3 + l_4 + l_5) \div 5$$

$$Average\ Stack\ Length_{Back} = (l_1 + l_2 + l_3 + l_4 + l_5) \div 5$$

$$Average\ Stack\ Length = (Average\ Length_{Front} + Average\ Length_{Back}) \div 2$$

3. Stack Width is Equal to the Average Length of Pieces that Make up the Width of the Stack. Refer to Table 1. "Minimum Number of Pieces to be Measured for Length" to determine how many pieces are to be measured. This dimension is calculated by averaging the length of individual pieces of wood in the stack. The wood can be stacked in a single or multiple rows. If the wood is stacked in several rows deep select a representative random sample from each row. If the wood needs to be stacked, measure the pieces prior to stacking. If the wood is already stacked, select the pieces at random by moving up and down and across the stack. If it is necessary to remove the wood from a stack to measure the individual piece lengths, always complete the height and length measurements before disturbing the stacked wood.

   - **Individual Piece Length:** Table 3-5. "Minimum Number of Pieces to be Measured for Length" requires that at least 12 pieces of wood be measured for every half cord estimated to be in the stack.

     - If the wood is uniform in shape, take at least one point-to-point measurement along the centerline of the longitudinal axis. (See Table 3-6a. "Determining Piece Length – Uniform Shape" for examples) and record the value.)

     - If the wood is irregularly shaped, take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a third at or near the centerline of the piece. (See Table 3-6b. "Determining Piece Length – Irregular Shape" for examples.) Calculate the average of the measurements to determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:

       $$AIPL = (L_1 + L_2 + L_3) \div 3$$

       After all pieces are measured total the lengths and divide the total by the number of samples to obtain the Average Piece Length for the stack. To determine Average Piece Length (APL) for the package:

       $$APL = (L_1 + L_2 + L_3 + L_n) \div (Number\ of\ Pieces\ in\ Sample)$$

4. Calculate Volume:

   $$Volume\ in\ liters = (Avg.\ Height\ [cm] \times Avg.\ Width\ [cm] \times Average\ Piece\ Length\ [cm]) \div 1000$$

   $$Volume\ in\ cubic\ feet = (Avg.\ Height\ [in] \times Avg.\ Width\ [in] \times Average\ Piece\ Length\ [in]) \div 1728$$

5. Supplemental Information on the Measurement of Stacked Wood.

   - Volume of a Triangle Stack of Wood – To calculate the volume of a triangular stack take at least two measurements (one each side) of the height and length, and five measurements of the width of the stack and average each result. Use this formula to calculate the volume. (See Figure 7. "Triangular Stack.")

     $$Volume\ of\ Triangular\ Stack = (Avg.\ Height \times Avg.\ Length\ of\ Base \times Avg.\ Width) \div 2$$

   - The volume of the triangular stack may be added to the volume of other stacks.

Figure 7. Triangular Stack.

c. Bundles and Bags

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

Figure 8. Firewood Bundle and Bag.

Test Note: To test a bag of firewood remove the wood from the bag and form a compact bundle and strap it as shown in Figure 9. "Bundle with Straps Placed `10 cm (4 in)"and follow the procedures for measuring a bundle.

2. Average Area of Bundle Ends: Place a cargo strap around each end of the bundle (or bag of wood) to prevent movement of the pieces during test. Place the straps approximately 10 cm (4 in) from the ends (See Figure 9. Bundle with Straps Placed 10 cm (4 in)" and tighten them securely.

Figure 9. Bundle with Straps Placed 10 m (4 in).

NOTICE: The NCWM must choose one of the following approaches for use in defining the perimeter of a bundle for area determinations.

Approach 1. Tape Defines the Perimeter

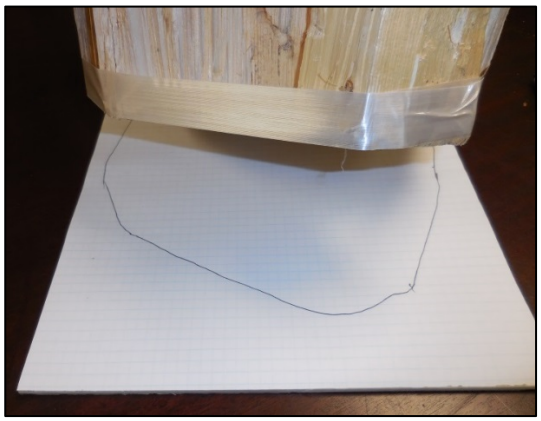
Notice: Do not use shrink wrap or packaging to define the perimeter because it can result in inaccurate measurements. If necessary trim the shrink wrap back from the ends to allow for the application of the tape which will be used to define the perimeter.

3. Affix packing tape (i.e., fiber reinforced) or other suitable strap around the perimeter of bundle at the extreme of each end (making sure that it is tautly stretched over all air spaces and that there is minimal deflection.) so that the tape or straps define the perimeters.

Figure 10. Bundles with Fiber Reinforced Packing Tape around the Perimeter of the Ends.

4. Set one end of the bundle or bag on graph paper large enough to cover the end completely. Draw a line around the outside of the perimeter of the tape on the graph paper using a sharp point marking pen. (See Figure 11.)

Figure 11. Tracing Perimeter of Bundle Outside the Tape.

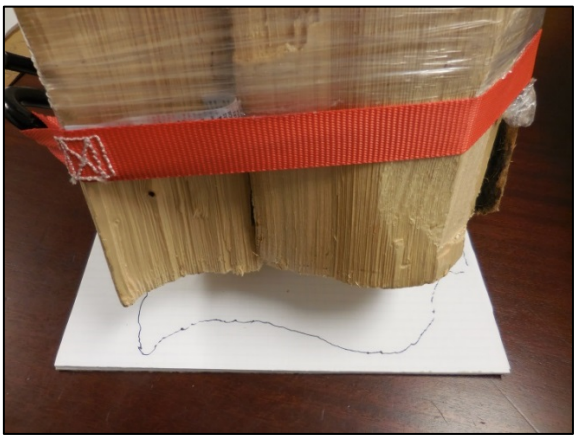


Approach 2. Wood Defines the Perimeter

NOTICE: Do not use shrink wrap or packaging to define the perimeter because it can result in inaccurate measurements. If necessary, trim the shrink wrap back from the ends to allow for the bundle to sit flat on the graph paper.

3. Set one end of the bundle or bag on graph paper large enough to cover the end completely. Draw a line around the outside of the wood perimeter on the graph paper using a sharp point marking pen (See Figure 12).

Figure 12. Tracing Perimeter of the Wood.



4. Set one end of the bundle or bag on graph paper large enough to cover the end completely. Draw a line around the outside of the wood perimeter on the graph paper using a sharp point marking pen.

For either proposal, follow the remaining steps to determine compliance.

5. 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. Repeat this process on the opposite end of the bundle or bag.

Examples:

1. *Using ¼ in^2 graph paper and a ruler with ¼ in graduations, large blocks of the area within the perimeter are quickly measured. This is done by using the ruler to determine the length and then width of the area that are each multiplied by 0.25 in (¼ in) to obtain the number of blocks in that dimension. The two values are multiplied to obtain the total number of blocks enclosed in the area. The areas in the partially covered blocks are rounded up or down to the nearest ¼ in by enclosing the whole square and placing an x in the partial spaces which are included in the blocks where the area has been rounded up. One reason for squaring the blocks is to simplify the counting.*

   Use a ruler to count blocks: *The rulers in Figure 13. "Perimeter of a Bundle Defined by the Wood" indicate the dimensions of the square are 7 1/4 in× 7 3/4 in. To obtain the number of blocks divide 7.25 by 0.25 to obtain the number of blocks along the left-hand line (7.25 ÷ 0.25 = 29). The bottom line measures 7 3/4 in so 7.75 ÷ 0.25 = 31. Multiple the two values to obtain the total number of squares within the area which is 29 × 31 = 899. To obtain square inches divide 899 by 16 (the number of ¼ inch blocks in a square inch) or 899 ÷ 16 = for area of 56.19 in^2 for this area of the bundle.*

   Continue to divide the area into blocks to make counting easier and then count the blocks in the remaining areas and sum these values to obtain the total. See the example in Figure 13. The total number of blocks was calculated by adding:

   46 + 145 + 899 + 25 + 8 + 54 = 1177 squares ÷ 16 = 73.56 in^2 for this end of the bundle.

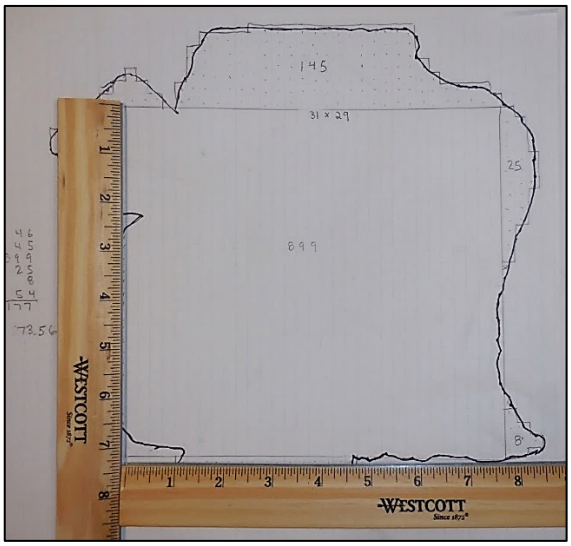


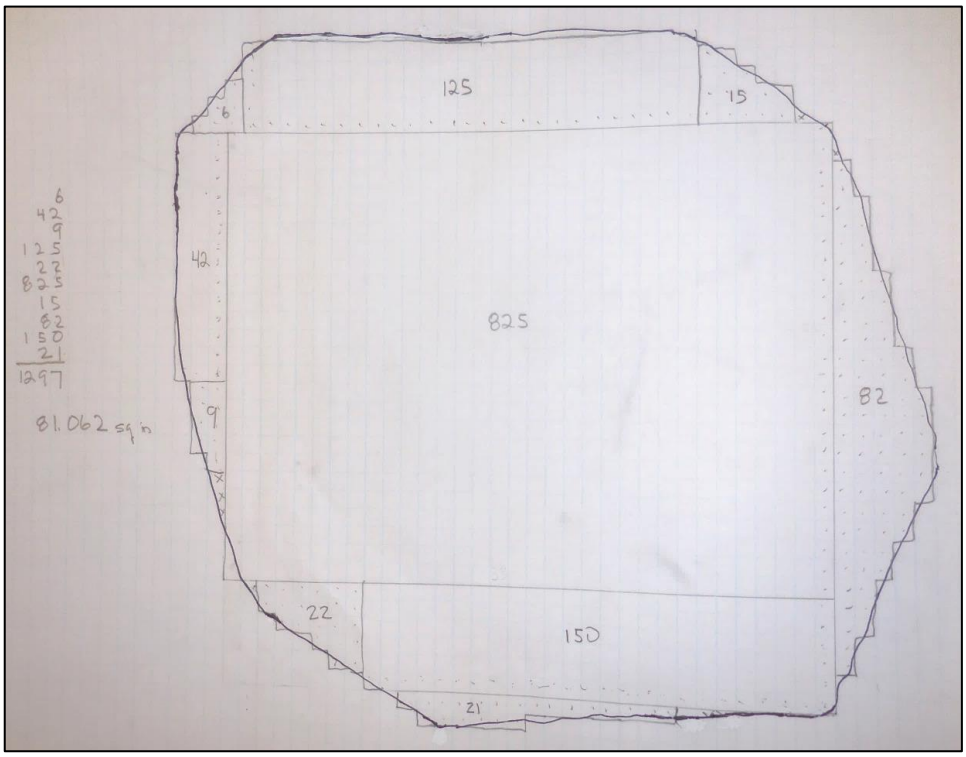
Figure 13. Perimeter of a Bundle Defined by the Wood.

2. *Figure 14, "Perimeter of a Bundle Defined by Tape or a Strap" provides another example of how determining the area can be simplified by "blocking" the areas out and calculating the number of blocks. For the example, in Figure 14 the total number of blocks was calculated by adding:*

   6 + 42 + 9 + 125 + 22 + 825 +15 + 82 + 150 + 21 = 1297 squares ÷ 16 = 81.06 in^2 for this end of the bundle.

   Calculate the Average Area: Average Area = (Area$_1$ + Area$_2$) ÷ 2

Figure 14. Perimeter of a Bundle Defined by Tape or a Strap.



6. Average length of the pieces of wood: Individual Piece Length – Remove the wood from the package and measure the length of each piece of wood. (See Table 3-5. "Minimum Number of Pieces to be Measured for Length" for the number of pieces to be measured.) If the piece of wood is uniform in shape, take at least one point-to-point measurement along the centerline of the longitudinal axis. (See Table 2a. "Determining Piece Length -– Uniform Shapes" for examples.) and record the value.

If the wood is irregularly shaped, take at least three measurements along a straight line between two points crossing solid wood that appear to be the shortest and longest dimensions, and a third measurement on or near the centerline of the piece. (See Table 2b. "Determining Piece Length – Irregular Shapes" for examples) Calculate the average of the measurements to obtain the Average Individual Piece Length and record the length of the piece.

To determine Average Individual Piece Length (AIPL) of irregularly shaped pieces:

$$AIPL = (L_1 + L_2 + L_3) \div 3$$

Note: If length measurements are made in millimeters divide the total by 10 to obtain centimeters.

After all pieces are measured, total the lengths and divide that total by the number of samples to obtain the Average Piece Length for the package.

To determine Average Piece Length (APL) for the package:

$$APL = (L_1 + L_2 + L_3 + \ldots L_n) \div (\text{Number of Pieces in Sample})$$

7. Use the average values for height, width, and length to calculate the volume of wood in the bundle or bag.

- Calculate Volume:

  Volume in liters = (Average Area [cm^2] × Average Length [cm]) ÷ 1000

  Volume in cubic feet = (Average Area [in^2] × Average Length [in]) ÷ 1728

Note: 1 ft^3 = 1728 in^3

3.14.3. Evaluation of Results

Follow Section 2.3.7. "Evaluate for Compliance" 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 Stove Wood labeled by Volume, and Packages Labeled by Count with 50 Items or Fewer."

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

	Maximum Allowable Variations (MAVs)
Packaged Firewood and Stove Wood Labeled by Volume	**25 % of labeled quantity** **Note: Use Table 2-5 "Maximum Allowable Variations for Packages Labeled by Weight" for packaged artificial and compressed fireplace logs and stove wood pellets and chips labeled by weight.**

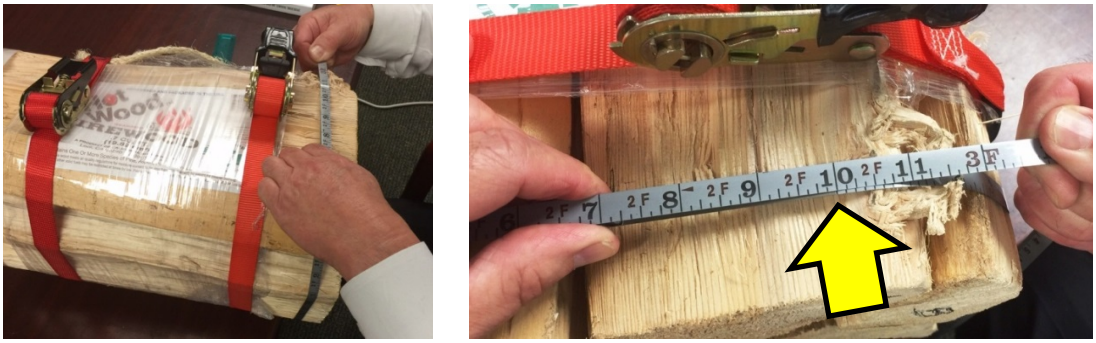
Field Audit Procedure

A circumference method can be used for quickly identifying potentially short measure bundles. The procedure is based on measuring the circumference of the package ends and calculating the areas without using graph paper. While the circumference method is a quick way to determine the areas, it is also less accurate than the graph paper method so it should not be used for official inspections. If this method is adopted, data will be collected for use in developing additional guidance on the use of this procedure for auditing purposes. The data collected will, among other factors, compare test results obtained using the reference procedure versus this auditing method.

Circumference Test Method

1. After the bundle or bag is secured, use a flexible measuring tape to measure the circumference around each end of the bundle or bag of firewood. Using one movement, extend the measuring tape around the end of the bundle or bag to obtain its circumference. The tape must be pulled tight. If the wood at the ends of a bag or bundle is not accessible due to plastic wrapping, the wrapping should be moved away from the ends so the measuring tape can be placed tightly around the bundle so circumference measurements can be taken.

Figure 15. Strapping the End of a Bundle.



At the Point of the Arrow the Circumference of the Bundle is 2 ft 10 in (34 in)

Note: The tape used has a blank end so the "0" line is visible immediately under the 10 in mark.

2. Calculate the Average Circumference:

$$Average\ Circumference = (circumference_1 + circumference_2) \div 2$$

For example: If $Circumference_1$ is 34 in and $Circumference_2$ is 33.75 in, then:

$$Average\ Circumference:\ 34 + 33.75 \div 2 = 33.875\ in$$

3. Calculate the radius:

$$radius = Average\ Circumference \div 2\pi$$

$$Where:\ \pi = 3.1415$$

Example:
$radius = 33.875 \div (2 \times \pi\ or\ 6.283) = 5.39\ in$

4. Calculate the *Average Area:*

$$Average\ Area = \pi r^2$$

Example:
$Average\ Area = 3.1415 \times 5.39^2\ (or\ 29.06) = 91.3\ in^2$

5. Calculate the Average Length of the Pieces:
Average length of the pieces of wood - Measure the length of several pieces of wood in the bundle or bag. Measurements are to be taken from center to center at the end of each piece.

Then calculate the average:

$$Average\ length = sum\ of\ the\ length\ of\ all\ pieces \div number\ of\ pieces$$

6. Calculate Volume:

$$Volume\ in\ liters = (Average\ area\ [cm^2] \times Average\ Length\ [cm]) \div 1000$$

$$Volume\ in\ cubic\ feet = (Average\ Area\ [in^2] \times Average\ Length\ [in]) \div 1728$$

Example:
Assume the average length of the pieces is 16 in and Average Area is 91.3 in^2

$$Bundle\ Volume = 91.3 \times 16 = 1460\ in^3\ or\ 0.84\ ft^3$$

If results indicate that the sample fails conduct further testing using the reference test procedure for bundles and bags. Do not take any legal action based solely on this audit procedure.

Appendix B.
NIST Handbook 133 (2015) Current Firewood Test Procedures

3.14. Firewood – Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less)

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.

3.14.1. 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.
- Tracing paper
- Graduated template in square centimeters or square inches

3.14.2. Test Procedures

d. Boxed Firewood

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. 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.

$$\textit{Average Height of Stack} =$$

$$\textit{(Internal Height of Box)} - \textit{(sum of measurements)} \div \textit{(number of measurements)}$$

3. 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.

$$\textit{Average Width} = (W_1 + W_2 + W_3) \div (3)$$

4. 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.

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div (5)$$

5. Calculate the volume of the wood within the box. Use dimensions for height, width, and length.

Volume in liters = (height in cm × width in cm × length in cm) ÷ (1000)

Volume in cubic feet = (height in inches × width in inches × length in inches) ÷ (1728)

6. 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 VR_1 and V_2. Compute total volume by adding Volume 1 (V_1) and V_2 according to the following formula.

$$Total\ Volume = V_1 + V_2$$

e. Crosshatched Firewood.

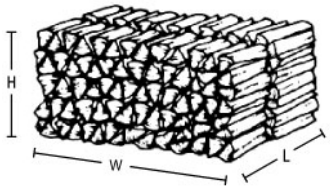


Figure 3-3. Stacked Firewood

1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. Stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular).

3. Determine the average measurements of the stack:

Note: The number of measurements for each dimension given below is the minimum that should be taken.

- 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.

4. Calculate Volume:

Volume in liters = (Avg. Height [cm] × Avg. Width [cm] × Avg. Length in [cm]) ÷ 1000

Volume in cubic feet = (Avg. Height [in] × Avg. Width [in] × Avg. Length [in]) ÷ 1728

f. Bundles and Bags of Firewood

Figure 3-4. Bundle of Firewood

- Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.
- 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.
- 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.
- 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.
- Repeat this process on the opposite end of the bundle or bag.
- Calculate the Average Area:

$$Average\ Area = (Area\ 1 + Area\ 2) \div 2$$

- 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:

$$Average\ Length = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

- Calculate Volume:

$$Volume\ in\ liters = (Average\ Area\ [cm^2] \times Average\ Length\ [cm]) \div 1000$$

$$Volume\ in\ cubic\ feet = (Average\ Area\ [in^2] \times Average\ Length\ [in]) \div 1728$$

1.14.3. Evaluation of Results.

Follow Section 2.3.7. "Evaluate for Compliance" 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 50 Items or Fewer." – Maximum allowable variations for individual packages are not applied to packages of firewood.

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Appendix C.
Current NIST Handbook 130 (2015) Uniform Method of Sale of Commodities Regulation
Section 2.4. Fireplace and Stove Wood.

2.4. Fireplace and Stove Wood. – For the purpose of this regulation, this section shall apply to the sale of all wood, natural and processed, for use as fuel or flavoring.

(Amended 1999)

2.4.1. Definitions.

2.4.1.1. Fireplace and Stove Wood. – Any kindling, logs, boards, timbers, or other wood, natural or processed, split or not split, advertised, offered for sale, or sold for use as fuel.

(Amended 1991)

2.4.1.2. Cord. – The amount of wood that is contained in a space of 128 ft^3 when the wood is ranked and well stowed. For the purpose of this regulation, "ranked and well stowed" shall be construed to mean that pieces of wood are placed in a line or row, with individual pieces touching and parallel to each other, and stacked in a compact manner.

2.4.1.3. Representation. –This shall be construed to mean any advertisement, offering, invoice, or the like that pertains to the sale of fireplace or stove wood.

2.4.1.4. Flavoring Chips. –Any kindling, logs boards, timbers, or other natural or processed, split or unsplit wood that is advertised, offered for sale, or sold for flavoring smoked or barbequed foods.

(Added 1999)

2.4.2. Identity. – A representation may include a declaration of identity that indicates the species group (for example, 50 % hickory, 50 % miscellaneous softwood). Such a representation shall indicate, within 10 % accuracy, the percentages of each group.

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:

(1) liters, to include fractions of liters**;** or

(2) cubic inches, if less than one cubic foot; or

(3) cubic feet, if one cubic foot or greater, to include fractions of a cubic foot.

(Amended 2010)

(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 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) liters, to include fractions of liters; or

(2) cubic inches, if less than one cubic foot; or

(3) cubic feet, if one cubic foot or greater, to include fractions of a cubic foot.

(Added 1998) (Amended 2010)

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 2010)

2.4.4. Prohibition of Terms. – The terms "face cord," "rack," "pile," "truckload," or terms of similar import shall not be used when advertising offering for sale, or selling wood for use as fuel.

2.4.5. Delivery Ticket or Sales Invoice. – A delivery ticket or sales invoice shall be presented by the seller to the purchaser whenever any non-packaged fireplace or stove wood is sold. The delivery ticket or sales invoice shall contain at least the following information:

(a) the name and address of the vendor;

(b) the name and address of the purchaser;

(c) the date delivered;

(d) the quantity delivered and the quantity upon which the price is based, if this differs from the delivered quantity;

(e) the price of the amount delivered; and

(f) the identity, in the most descriptive terms commercially practicable, including any quality representation made in connection with the sale.

(Added 1975)

Appendix D.
Proposed Test Procedure Submitted to NIST by California Hot Wood Inc.

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3.14. Firewood – Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L [4 ft^3] or Less)

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.

3.14.1. Test Equipment:

a. Boxed Firewood

- Straight Edge
- Linear Tape Measure

b. Crosshatched Firewood

- Measuring Tape

c. Bundles and Bags of Firewood

- Binding Straps – Two binding straps, 1 in to 2 in wide with connecting buckles and long enough to easily encircle the Bundle or Bag to secure the wood during testing.
- Flexible Measuring Tape

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.**~~
- ~~**Tracing paper**~~
- ~~**Graduated template in square centimeters or square inches**~~

3.14.2. Test Procedures

g. Boxed Firewood

8. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

   Open the box and if the box contains a bundle or bag of firewood remove the bundle or bag and calculate the volume in accordance with Section C (Bundles and Bags of Firewood).

9. 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.

$$\textit{Average Height of Stack} = \textit{(Internal Height of Box)} - \textit{(sum of measurements)} \div \textit{(number of measurements)}$$

10. 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.

$$\textit{Average Width} = (W_1 + W_2 + W_3) \div 3$$

11. 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.

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

12. Calculate the volume of the wood within the box. Use dimensions for height, width, and length.

$$\textit{Volume in liters} = \textit{(height in cm} \times \textit{width in cm} \times \textit{length in cm)} \div 1000$$

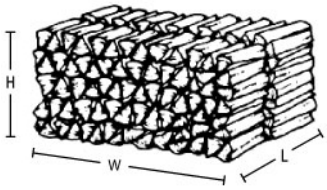
$$\textit{Volume in cubic feet} = \textit{(height in inches} \times \textit{width in inches} \times \textit{length in inches)} \div 1728$$

13. 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 VR_1 and V_2. Compute total volume by adding Volume 1 (V_1) and V_2 according to the following formula.

$$\textit{Total Volume} = V_1 + V_2$$

h. Crosshatched Firewood

Figure 3-3. Stacked Firewood



1. Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

2. Stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular).

3. Determine the average measurements of the stack:

Note: The number of measurements for each dimension given below is the minimum that should be taken.

- 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.

4. Calculate Volume:

Volume in liters = (Avg. Height [cm] × Avg. Width [cm] × Avg. Length in [cm]) ÷ 1000

Volume in cubic feet = (Avg. Height [in] × Avg. Width [in] × Avg. Length [in]) ÷ 1728

i. Bundles and Bags of Firewood

Figure 3-4. Bundle of Firewood

- Follow Section 2.3.1. "Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; and select a random sample.

- Average area of ends: secure a strap around each end of the bundle or bag of wood to prevent movement during testing. Each strap is to be placed approximately 4 inches from each end of the Bundle or Bag. See Diagram.

~~and to provide a definite perimeter. Use two or more straps to secure the wood.~~

- ~~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.~~

- ~~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.~~

- ~~Repeat this process on the opposite end of the bundle or bag.~~

- ~~Calculate the Average Area:~~

$$\textit{Average Area} = (\textit{Area 1} + \textit{Area 2}) \div 2$$

- ~~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:~~

$$\textit{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

- ~~Calculate Volume:~~

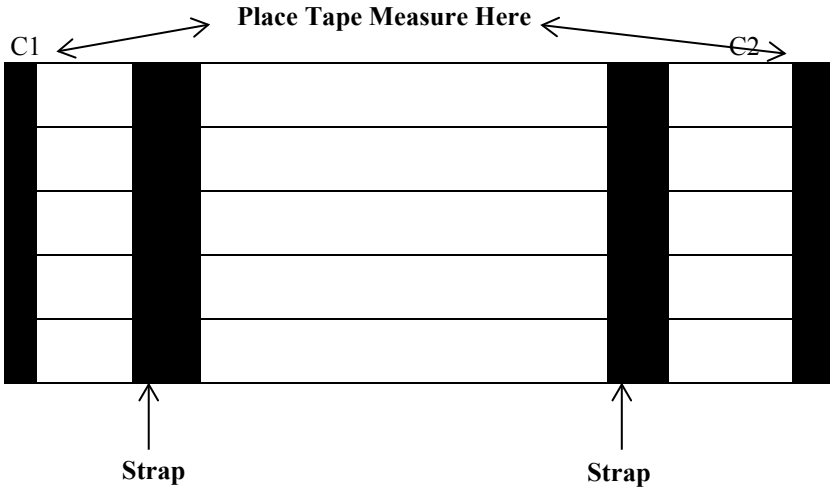
$$\textit{Volume in liters} = (\textit{Average Area } [cm^2] \times \textit{Average Length } [cm]) \div 1000$$

$$\textit{Volume in cubic feet} = (\textit{Average Area } [in^2] \times \textit{Average Length } [in]) \div 1728$$

3.14.3. Evaluation of Results

~~Follow Section 2.3.7. "Evaluate for Compliance to determine lot conformance.~~

After the Bundle or Bag is secured and utilizing a flexible measuring tape, measure around each end of the bundle or bag of firewood with one movement by extending the measuring tape around the entire end of the bundle or bag in order to obtain a circumference. If the wood at the ends of a bag or bundle is not accessible due to plastic wrapping, then the flexible measuring tape is placed tightly around the outside of the plastic wrapping and circumference measurements are taken. See Diagram:



Calculate the average Circumference

Average Circumference = (circumference 1 + circumference 2) /2

Calculate the Average Area using the average circumference (from above)

$$AREA = \pi R^2$$

$$R = C/2\pi$$

$$\pi = 3.1415$$

Calculate the Average Length

Average length of the pieces of wood - Measure the length of each piece of wood in the bundle or bag

Measurements are to be taken from center to center at the end of each piece. Then calculate their average:

Average length = sum of all pieces / number of pieces.

Calculate Volume:

Volume in liters = (Average area [cm²] × Average Length [cm]) / 1000

Volume in cubic feet = (Average Area [in²] × Average Length) / 1728

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Appendix E.
Resources on Wood Measurement

All Resources Accessed Online during April – July 2015

1. "A Guide to Buying and Measuring Firewood"

www.novascotia.ca/natr/publications/energy/buyfirewood.pdf

2. "A Cord of Wood" California News Station with Weights and Measures Officials

www.bing.com/videos/search?q=measuring+a+cord+of+firewood&FORM=VIRE4#view=detail&mid=B406FD46F5EE762A5ECFB406FD46F5EE762A5ECF

3. National Forest Log Scaling Handbook

www.fs.fed.us/fmsc/measure/handbooks/index.shtml

4. Firewood Test Procedures of the California Division of Measurement Standards:

www.cdfa.ca.gov/dms/programs/qc/QCFirewoodRegs.pdf

5. Figuring Firewood by the Cord, Anyway You Stack It

www.lakebarcroft.org/association/newsletters-reports/firewood-1
www.lakebarcroft.org/association/newsletters-reports/firewood-2
www.lakebarcroft.org/association/newsletters-reports/firewood-3

6. Criss-Cross Stacking

pinnaclefirewood.com/crissx.php

7. Maine Firewood Fact Sheet

www.maine.gov/tools/whatsnew/index.php?topic=Agriculture+News&id=4554&v=Article

8. Minnesota Statute Defining a Cord

www.revisor.mn.gov/statutes/?id=239.33

9. Minnesota – Buying Firewood

mn.gov/commerce/weights-and-measures/images/BuyingFirewood.pdf

10. National Firewood Association

nationalfirewoodassociation.org/

11. Oklahoma Cooperative Extension Service NREM-9440 – Firewood: How to Obtain, Measure, Season, and Burn

pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2507/NREM-9440web.pdf

12. Idaho Log Scaling Manual

www.ibsp.idaho.gov/IdahoLogScalingManual-2008%20Edition%20(print).pdf

13. Nova Scotia Log Scaling Manual

novascotia.ca/natr/forestry/scaling/pdf/ScalingManual.pdf

14. British Columbia Log Scaling Manual – SI

www.for.gov.bc.ca/hva/manuals/scaling.htm

15. WoodHeat.org

www.woodheat.org/index.php

Report of the Specifications and Tolerances (S&T) Committee

Mahesh Albuquerque, Committee Chair
Colorado

300 INTRODUCTION

This is the final report of the Specifications and Tolerances (S&T) Committee (hereinafter referred to as the "Committee") for the 101st Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, "Committee Reports," testimony at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The Informational items shown below were adopted as presented when this report was approved. This report contains those recommendations to amend National Institute of Standards and Technology (NIST) Handbook 44 (2016), "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."

Table A identifies the agenda and appendix items by reference key, title of item, page number, and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of the Reference Key Numbers of the items are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **Informational (I) Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from 9consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered individually; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the open hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. When used in this report, the term "weight" means "mass."

Note: The policy of NIST and NCWM is to use metric units of measurement in all of their publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to U.S. customary units.

Subject Series List

Table A
Table of Contents

Appendices **Page**

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
API	American Petroleum Institute	NCWM	National Conference on Weights and Measures
CC	Certificate of Conformance	NEWMA	Northeastern Weights and Measures Association
CNG	Compressed Natural Gas	NIST	National Institute of Standards and Technology
CWMA	Central Weights and Measures Association	NGSC	NCWM Natural Gas Steering Committee
DGE	Diesel Gallon Equivalent	NTEP	National Type Evaluation Program
DLE	Diesel Liter Equivalent	OIML	International Organization of Legal Metrology
DOT	Department of Transportation	OWM	Office of Weights and Measures
FALS	Fuels and Lubricants Subcommittee	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GGE	Gasoline Gallon Equivalent	SD	Secure Digital
GLE	Gasoline Liter Equivalent	SI	International System of Units
GMM	Grain Moisture Meter	SMA	Scale Manufactures Association
GPS	Global Positioning System	SWMA	Southern Weights and Measures Association
IEC	International Electrotechnical Commission	TC	Technical Committee
LMD	Liquid Measuring Devices	USNWG	U.S. National Work Group
LNG	Liquefied Natural Gas	WIM	Weigh-in-Motion
MMA	Meter Manufacturers Association	WWMA	Western Weights and Measures Association

Table C
Summary of Voting Results

Reference Key Number	*House of State Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
Consent Calendar: **310-1, 310-2, 320-2, 320-3, 330-1, 330-3, 331-1, 331-2, 331-4, 332-1, 332-2, 332-3, 332-4, 332-7, 334-1, 335-1, 337-1, 338-1, 338-2, 339-1, 354-2, 354-3, 354-4, 358-1, 358-2, 358-3, 360-4**	38	0	45	0	Adopted
330-2	36	3	39	10	Adopted
337-2	30	7	30	11	Adopted
339-2	29	7	40	6	Adopted
354-1	35	1	49	0	Adopted
To Accept the Report	Voice Vote				Adopted

Details of All Items
(In order by Reference Key)

310 NIST HANDBOOK 44 - GENERAL CODE

310-1 V G-S.1. Identification. – (Software)

(This item was Adopted.)

Source:
This item originated from the NTEP Software Sector and first appeared on NCWM S&T Committee's 2007 agenda as Developing Item Part 1, Item 1 and in 2010 as Item 310-3.

Purpose:
Provide marking requirements that enable field verification of the appropriate version or revision for metrological software, including methods other than "permanently marked," for providing the required information.

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

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ***~~not built for purpose software based software devices~~ software****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **and 2016**)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices~~;~~ **manufactured as of January 1, 2004 and all software-based devices (or equipment) manufactured as of January 1, 2022;**
~~*[Nonretroactive as of January 1, 2004]*~~
(Added 2003) **(Amended 2016)**

(1) The version or revision identifier shall be:

i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.
(Added 2016)

ii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2022]
(Added 2016)

(2) *Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).* ***Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]
(Added 2006) **(Amended 2016)**

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

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006, **and 2016**)

Background/Discussion:
The Item under Consideration above replaces that which was presented at the 100th NCWM Annual Meeting in July 2015 at the request of the NTEP Software Sector Committee and includes additional modifications made by the Committee at the 101st Annual Meeting in July 2016.

Among other tasks, the NTEP Software Sector was charged by the NCWM Board of Directors to recommend NIST Handbook 44 specifications and requirements for software incorporated into weighing and measuring devices, which

may include tools used for software identification. During its October 2007 meeting, the Sector discussed the value and merits of required markings for software, including possible differences in some types of software-based devices and methods of 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 the device make, model, and serial number to comply with G S.1. Identification.

In 2008, the Software Sector developed and submitted a proposal to the NCWM S&T Committee to modify G-S.1. and associated paragraphs to reflect these technical requirements. Between 2008 and 2011, this item appeared on the S&T Committee's main agenda and the Committee and the Sector received numerous comments and suggestions relative to the proposal. The Sector developed and presented several alternatives based on feedback from weights and measures officials and manufacturers. Among the key points and concerns raised during discussions over this period were how to address the following:

(a) **Limited Character Sets and Space.** – How to address devices that have limited character sets or restricted space for marking.

(b) **Built-for-Purpose vs. Not-Built-for-Purpose.** – Whether or not these should be treated differently.

(c) **Ease of Access.** – Ease of accessing marking information in the field.

- Complexity of locating the marking information
- Use of menus for accessing the marking information electronically
- Limits on the number of levels required to access information electronically
- Possibility of single, uniform method of access

(d) **Hard Marking vs. Electronic.** – Whether or not some information should be required to be hard marked on the device.

(e) **Continuous Display.** – Whether or not required markings must be continuously displayed.

(f) **Abbreviations and Icons.** – Establishment of unique abbreviations, identifiers, and icons and how to codify those.

(g) **Certificate of Conformance Information.** – How to facilitate correlation of software version information to a CC, including the use of possible icons.

Further details on the alternatives considered can be found in the Committee's Final Reports from 2008 to 2015.

OWM's 2014 Amendments to the Proposal:
Prior to the 2014 NTEP Weighing Sector (WS) meeting, members of OWM's Legal Metrology Devices Program (LMDP) amended the proposal appearing on the Committee's agenda in 2014; this was done after being asked by the NTEP Software Sector (SS) to provide additional input and draft modifications to paragraphs G-S.1. and G.S.1.1. in consideration of the goals of the SS and the comments provided during the 2014 open hearings of the S&T Committee relating to this item. *Technical Advisors note: It was OWM's amended version of the proposal that was reviewed by the Sectors at the joint meetings of the WS and SS in 2014, and the MS and SS in 2015 and, after slight modification, was voted on and approved at the NCWM Annual Meeting in 2016.*

The following is a list of the goals provided by the SS in modifying G-S.1. and G.S.1.1. as communicated to the members of OWM's LMDP:

1. Remove the existing distinction between software identification requirements for built-for-purpose and not-built-for-purpose devices.

2. Require that <u>all</u> software-based devices have a software version or revision identifier for metrologically significant software.

3. Require that <u>certified</u> software versions or revision identifiers for metrologically significant software are recorded on the CC for access by inspectors. Software itself does not require serial numbers.

4. Require that a software-based device's version or revision identifier shall be accessible via the display and user interface and only if the device's display is incapable of displaying the identifier or has no display and/or interface; then permanently marking the version or revision identifier shall be acceptable (e.g., a digital load cell).

5. Nonretroactive as of January 1, 2016, if passed by the NCWM in July 2015.

OWM's LMDP developed the following proposed alternative changes to G-S.1. (based on the SS's request for additional input on how best to meet its goals) and forwarded them to the Chairman of the SS for consideration at the 2014 WS/SS joint meeting:

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

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ***~~not-built-for-purpose software-based devices~~ <u>software</u>****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices~~;~~ **manufactured as of January 1, 2004 through December 31, 2015, and all software based devices or equipment manufactured as of January 1, 2016;**
~~*[Nonretroactive as of January 1, 2004]*~~
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be:

i. prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;
[Nonretroactive as of January 1, 2007]
(Added 2006)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2016]
(Added 20XX)

iii. continuously displayed* or be accessible via the display menus. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2016]
(Added 20XX)

****The version or revision identifier shall be displayed continuously on software-based equipment with a digital display manufactured as of January 1, 20XX and all software-based equipment with a digital display as of January 1, 20YY.***

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

(1) *The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)*
[Nonretroactive as of January 1, 2003]

> The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
>
> (Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006 **and 201X**)

OWM's LMDP did not propose any changes to subparagraph G-S.1.1. since the SS had indicated earlier that it may be possible to eventually eliminate G-S.1.1. Additionally, OWM's LMDP made it known to the SS that the shaded portion of G-S.1.(d)(1)iii. of their proposed alternative changes, did not reflect any of the goals communicated by the SS and was being offered for consideration with the understanding that:

1. this change will make it easier in the future for inspectors to be able to identify software installed in equipment;

2. a reasonable amount of time for the changes to take effect can be specified; and

3. it is probable that improvements in technology over time will make it easier for equipment manufacturers to comply.

2014 Joint Meeting of the NTEP Weighing and Software Sectors:
At its 2014 meeting, the WS met jointly with the SS to consider the proposal as amended by OWM's LMDP. After further amending it, the two Sectors agreed to submit the revised proposal to the weights and measures regional associations for consideration and requested the item's status be changed from Developing to Informational. It was also decided during the joint meeting that no changes to G-S.1.1. were necessary since the two sectors had agreed that the term "not-built-for-purpose software-based devices" in G-S.1.(d) would be retained. See the 2014 Weighing Sector Meeting Summary for additional details and to view the changes made to the proposal at the joint WS/SS meeting.

2015 Joint Meeting of NTEP Measuring and Software Sectors:
At its 2015 meeting, the MS met jointly with the SS to consider the proposal that had been revised at the joint meeting of the WS and SS in 2014. Some additional changes were made to the proposal at the MS/SS meeting to address some remaining concerns. See the 2015 SS Meeting Summary for details.

The two Sectors (MS and SS) agreed to forward the proposal to each of the regional S&T Committees and ask they consider assigning it a Voting status. They also recommended that the National Committee consider making this a Voting item in 2016.

See the 2015 S&T Committee's Annual Report to view a summary of the comments that the Committee received on the revised proposal to amend paragraphs G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices and the actions taken by the Committee on this item.

2016 NCWM Interim Meeting:
At its 2016 NCWM Interim Meeting open hearings, the Committee received comments in support of the proposal from regulatory officials and industry representatives alike. Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), in his capacity as Chairman of the Measuring Sector, reported that the Measuring Sector had reviewed the most recent proposal at its 2015 meeting and members of the Sector supported the language as written. Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that its members supported the proposal. Ms. Tina Butcher (NIST, OWM) noted that OWM continues to support the efforts of the Software Sector (SS) and believes the current proposal is close to being agreeable to members of the different Sectors who have participated in its development. In its analysis of the proposal, OWM questioned whether or not it would be clear to those *not* involved in the development of the language, what is meant by, "a device that does not *always* have an integral interface" in G-S.1.(d)(1)ii. With respect to this concern, OWM had contacted the Chairman of the SS who explained that some meter manufacturers had indicated that they offer an optional display with some products. For production purposes, it would be preferable to hard mark all such devices, not knowing if they will be deployed with a display. OWM suggested, should the Committee also believe that the language is not clear, it might consider amending the proposal by adding additional clarification to improve understanding. OWM offered the following for consideration:

ii. continuously displayed…device does not always have an integral interface to communicate (i.e., a display is offered as optional equipment by the manufacturer) the version or revision identifier.

OWM also suggested the following change to the proposed note in (1) i. of the proposal:

Note: If the equipment is capable of displaying the version or revision identifier but ~~is unable to meet~~ incapable of complying with the formatting requirement, other options may be deemed acceptable through the NTEP type evaluation process, and described in the CC.
(Added 20~~XX~~17)

Ms. Butcher also noted that in considering the proposed removal of the language "directly linked to the software itself" in ii. of the previous version of the proposal, OWM recognizes that if it is possible to independently modify the version number without any changes to the software itself (or vice versa), this would facilitate fraud. Thus, it is important that type evaluation criteria be included in NCWM Publication 14 to verify that neither one can be changed without changing the other. Consideration might be given to proposing the addition of a requirement discussed by the SS in 2010 as a *future* proposal in NIST Handbook 44 or NCWM Publication 14. Ms. Butcher shared the following proposed requirement that had been discussed by the SS in 2010:

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

In discussing this item, members of the Committee agreed that the language in the current proposal could perhaps be made clearer, yet they were reluctant to change the proposal given its wide acceptance by all the different parties involved in its development. Consequently, the Committee agreed to recommend this item as shown in the Item Under Consideration for Vote.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee received a number of comments in support of the proposal and no comments in opposition.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA supports the work of the Software Sector; supports this item as written; and recommended the item move forward as a Voting item.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, also voiced support for the item as written.

Ms. Tina Butcher (NIST, OWM) stated that OWM continues to support the efforts of the Software Sector and believes the current proposal, if adopted, is likely to achieve the goals established by that Sector as communicated to OWM in 2014. She reiterated a previous OWM suggestion to insert parenthesis around the words "or equipment" in G-S.1.(d) of the proposal and asked the Committee to insert this into the current proposal. She also asked that the Committee consider creating a new item for consideration in the 2016 - 2017 NCWM cycle which would propose the addition of some new language into paragraph G-S.1. to address the SS's earlier removal of the language, "directly linked to the software itself." In making this suggestion, Ms. Butcher noted that NIST, OWM believes it is important that type evaluation criteria be included in NCWM Publication 14 to verify that any change to metrologically significant elements of software used in the device coincides with an update to the version number for that software. The ability to independently change either the version number or the software without a corresponding change to the other would facilitate the perpetration of fraud.

During the Committee's open hearings, the Committee agreed the words "or equipment" in G-S.1.(d) of the proposal should be contained inside of parentheses as suggested by NIST, OWM and the Committee amended the proposal accordingly, as shown in Item Under Consideration. With respect to OWM's second suggestion that the Committee create a new item for consideration in the 2016 - 2017 NCWM cycle, members of the Committee asked the NIST Technical Advisor if OWM might do this, rather than the Committee, since it was OWM's suggestion. The Committee agreed to recommend the item, as amended, for Vote.

Regional Association Comments:
At its 2015 Annual Meeting, the WWMA reviewed the amended proposal. During opening hearings, it was noted that the SMA would discuss this proposal at their November meeting. The NTEP Software Sector had agreed to replace the proposal that appeared in the agenda of the 2015 Annual Meeting with this proposal. The WWMA recommended that this item be an Informational item.

At its fall 2015 Interim Meeting, the CWMA received comments that this item is a revision from the original. A representative of Mettler-Toledo commented that a key change was the removal of a requirement that the software version be linked with the software itself. The industry representative indicated the item is ready to be moved to a Voting status, although there has been no input or comments from the scale manufacturers sector. The CWMA recommended that this item be a Voting item and reaffirmed this position at its spring 2016 Annual Meeting.

At its fall 2015 Interim Meeting, NEWMA reported that it believes this item, which has been developing for a number of years, has shown significant progress; however, it is not ready for a Vote. NEWMA recommended that the item remain a Developing item. At its spring 2016 Annual Meeting, NEWMA reported it believes the item is fully developed and recommended it be presented for Vote at the upcoming NCWM Annual Meeting.

At its 2015 Annual Meeting, the SWMA recommended that this item be a Voting item as proposed based on the comments heard during open hearings and the Committee's position last year on the item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

310-2 V G-S.9. Metrologically Significant Software Updates

(This item was Adopted.)

Source:
NTEP Software Sector (2016)

Purpose:
Clarify that metrologically significant software shall be sealable.

Item under Consideration:
Amend NIST Handbook 44 General Code as follows:

G-S.9. Metrologically Significant Software Updates. – A software update that changes the metrologically significant software shall be considered a sealable event.

(Added 2016)

Background/Discussion:
The NTEP Software Sector believes that metrologically significant software is equally as important as other sealable parameters. While G-S.8. could be construed as requiring software to be sealable, it would be better to make the requirement explicit. G-S.8 refers to changing adjustable components, which may be interpreted as not being applicable to software.

The Software and Measuring Sector attendees, as well as the lab representatives, are in consensus that the proposed G-S.9. should be moved forward to the S&T Committee to be considered as a Voting item in 2016. The proposal was also reviewed with the Weighing Sector in 2014 and gained their consensus.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting open hearings, several regulatory officials and industry representatives voiced support for the proposal. Ms. Tina Butcher (NIST, OWM) commented that it is only reasonable to expect

metrologically significant software updates to be protected using a physical seal or other means of security. Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), speaking on behalf of the Measuring Sector, agreed with NIST, OWM that this is a reasonable expectation. Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA supports the efforts of the Software Sector and recommends the item move forward as a Voting item.

The Committee did not receive any comments opposing this proposal and, considering the comments heard in support, the Committee agreed to recommend the item for Vote.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee received comments in support of the item from Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, and Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA. Ms. Tina Butcher (OWM) reiterated the comments OWM provided at the 2016 NCWM Interim Meeting that it is reasonable to expect metrologically significant software updates to be protected with a physical seal or other means of security.

Hearing no comments in opposition to the proposal and in consideration of the comments heard in support of it, the Committee agreed to present the item for Vote.

Regional Association Comments:
At its fall 2015 meeting, the WWMA did not receive any comments on this item during opening hearings. The WWMA S&T Committee supports and appreciates the Software Sector's work on this item. The WWMA forwarded the item to NCWM, recommending that it be a Voting item.

At its 2015 fall Interim Meeting, the CWMA received comments from a representative of Mettler-Toledo indicating this item is ready to be moved to Voting status. A Minnesota regulatory official also supported the concept and commented that the item should move to Voting status. The CWMA forwarded this item to NCWM and recommended that it be a Voting item. The CWMA also recommended the item move forward as a Voting item at its spring 2016 Annual Meeting, reporting that it feels this item is fully developed and that the comments received during the meeting were in support of the item.

NEWMA reported, at its fall 2015 Interim Meeting, that it believes the metrologically significant software changes should be considered sealable parameters. NEWMA forwarded this item to NCWM and recommended that it be a Voting item. NEWMA also recommended a Voting status on the item at its spring 2016 Annual Meeting.

At its fall 2015 meeting, the SWMA heard no comments in opposition to this item and forwarded it to NCWM, recommending that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

320 SCALES

320-1 W S.1.1.3. Automated Batching Systems (See Related Item 360-3)

(This item was Withdrawn.)

Source:
Richard Suiter Consulting (2016)

Purpose:
Assist weights and measures officials in determining the accuracy and correctness of batching systems already in the marketplace. The proposed language will also assist NTEP in future evaluations of these systems.

Item under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

S.1.1.3. Automated batching Systems. – On an automated batching system making more than one draft, between drafts the system must return to a "center-of-zero" condition before a subsequent draft can begin. If the system fails to return to a "center-of-zero" condition the system shall interrupt the weighing sequence and shut down until the non-zero condition has been corrected.
[Nonretroactive as of January 1, 201X]

Background/Discussion:
Automated batching systems have existed in the marketplace for quite some time. NTEP has issued CCs for a number of these systems. There has always been the assumption that the systems would be required to meet NIST Handbook 44, Section 2.20. Scales. For systems with an NTEP CC, NTEP has used Section 2.20. to conduct the evaluation. There has been some concern in the more recent past regarding the ability of the systems to return to zero between drafts. While this is implied by other paragraphs in the section, it is not perfectly clear. This proposal will clarify that the systems are in fact required to return to zero at the end of each draft.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee agreed to group Items 320-1 and 360-3 together and receive comments simultaneously on these two items. The Committee acknowledged receiving written comments in opposition to both items in the group from Mr. Henry Oppermann (Weights and Measures Consulting, LLC).

Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the SMA reported that the SMA opposes Item 320-1 for the following reasons:

- NIST Handbook 44 does not specify that other applications must return to a center-of-zero reference.
- There is no definition for an automated batching system in NIST Handbook 44.
- The technical merit for the proposed change is unclear.
- The SMA has concerns about how this change may affect equipment design and impact users of these systems.

With respect to Item 360-3, the SMA supports the item, but proposes the word "raw" be removed from the definition.

Mr. Rick Harshman (NIST, OWM) commented that OWM agrees with the SMA's comment that the technical merit of the proposal in Item 320-1 is unclear. OWM does not believe the changes proposed are needed because:

1. requirements have already been established in the Scales Code to ensure that scales, including those used in an automated batching operation, return to zero once the load is removed from the load-receiving element; and
2. the "Zero-Load Balance Change" test in Scales Code paragraph N.1.9. confirms whether or not a scale consistently returns to zero once the load has been removed.

This test is considered part of the basic performance test of any scale (two exceptions being test procedures for ABWSs and single-draft, manually operated receiving hopper scales installed below grade and used to receive grain).

Mr. Harshman explained that to verify return to zero on an automated weighing system (including an automated batching system), it is necessary to observe the weighing system while in automatic operation. By observing the system in automatic operation, officials are able to tell whether or not:

- the value recorded for each draft weighed is the same as the value indicated for those drafts once loading has ceased and the weight of the load has stabilized; and

- all of the product for each draft discharges or is otherwise removed from the weighing/load-receiving element and that the scale then returns to zero before the next loading cycle commences.

If the scale is not returning to zero at the end of the discharge cycle, the scale should be rejected for failure to return to a zero-load balance condition.

An additional safeguard intended to ensure scales begin a weighing operation from a zero-load reference condition is Scales Code paragraph UR.4.1., which requires scale operators to maintain scales on zero at all times when the load-receiving element is empty.

Mr. Harshman noted NIST, OWM is aware of some automated weighing systems that do not consistently return to zero following the discharge of product during the discharge cycle due to: the density of the products being weighed; and the susceptibility of the product being weighed to cling to the weighing/load-receiving element; etc. Some of these systems do not meet the current NIST Handbook 44 definition of an "automatic bulk weighing system" nor the provisions of the ABWS Code. Product remaining in a weigh hopper or drum following the discharge cycle (often referred to as a "heel") on a system that is automatic in operation results in a zero-load balance change. To determine accurately the amount of product discharged in each draft, the system must take into account the weight of each remaining heel and subtract it from the weight indicated for its corresponding load. It would not be appropriate in such cases for there to be an interlock that halts automatic operation and requires intervention of an operator to determine the cause of failure to return to zero. Furthermore, if intervention were to simply re-zero the scale, such action would result in false weighments.

With regard to adding a definition for "batching system" as proposed in Item 360-3, Mr. Harshman indicated that it is OWM's view that there would be no benefit to adding the definition unless Item 320-1 is adopted.

Mr. Richard Suiter (Richard Suiter Consulting) explained that the intent of his proposal in Item 320-1 was to merely add an additional safeguard intended to apply to those applications where the system does normally return to zero following discharge of the product during the discharge cycle. Mr. Suiter acknowledged the existence of some automated weighing systems that will typically retain a heel following discharge of the product during the discharge cycle. He agreed that more work was needed to draft requirements that could be applied to such systems.

With respect to Item 360-3, he encouraged the Committee to consider adopting the definition of "batching system" and reminded the Committee that the term is used in the Scales Code of NIST Handbook 44. He indicated that he had no objection to deleting the word "raw" from the proposed definition as recommended by the SMA.

In considering Item 320-1, the Committee, during its work session, agreed with the concept that an interlock might provide an added safeguard for some systems to start the next weighing cycle from a proper zero-load reference (e.g., systems that typically return to zero following discharge of the product). However, the Committee agreed to Withdraw this item based on concerns over the impact it might have on those automated weighing systems that do not consistently return to zero following discharge of the product, as was reported by OWM. The Committee agreed that if the correction made by an operator were to simply zero the scale when the change in zero was caused by a heel remaining on the weighing/load-receiving element, such action would likely result in an inaccurate weight determination.

With respect to Item 360-3, the Committee agreed to amend the proposed definition by deleting the word "raw" as suggested by the SMA and as shown in Item Under Consideration for Item 360-3. The Committee further agreed to present the Item 360-3 for Vote at the Annual Meeting.

Regional Association Comments:
At its 2015 Annual Meeting, the WWMA heard support for moving this item forward as a Voting item from an industry representative. Ms. Tina Butcher, NIST OWM, commented that a similar item was submitted to the CWMA and recommended a status of Developing so that the two items can be reconciled. The WWMA believes that this item has merit and forwarded it to NCWM, recommending it be a Voting item.

At its 2015 Interim Meeting, the CWMA received comments from Mr. Richard Suiter, an industry consultant, indicating he submitted this proposal as a "clean-up" item related to batching systems including the concern of the return to zero, which is made clear in this proposal. The CWMA forwarded the item to NCWM and recommended that it be a Voting item.

NEWMA reported at the 2015 Interim Meeting, it believes the item has merit and forwarded it to NCWM recommending it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

320-2 V S.5.4. Relationship of Load Cell Verification Interval to the Scale Division

(This item was Adopted.)

Source:
Scale Manufacturers Association (2016)

Purpose:
Clarify the relationship of V_{min} to d with multiple independent load receivers.

Item under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

S.5.4. Relationship of Minimum Load Cell Verification Interval Value to the Scale Division. – *The relationship of the value for the* ***minimum*** *load cell verification interval, v_{min}, to the scale division, d, for a specific scale* ~~***installation***~~ *using NTEP* ***certified*** *load cells shall comply with the following formulae where N is the number of load cells in* ***a single independent[1] weighing/load-receiving element*** ~~***the scale***~~ *(such as hopper,* ~~***or***~~ ***railroad track or*** *vehicle scale weighing/load receiving elements);*

(a) $v_{min} \leq \frac{d^*}{\sqrt{N}}$ *for scales without lever systems; and*

(b) $v_{min} \leq \frac{d^*}{\sqrt{N} \times (scale\ multiple)}$ *for scales with lever systems.*

[1] Independent means with a weighing/load-receiving element not attached to adjacent elements and with its own A/D conversion circuitry and displayed weight.

*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae above.]*

This requirement does not apply to complete weighing/load-receiving elements or scales, which satisfy all the following criteria:

- *the complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the NTEP;*
- *the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and*
- *the complete weighing/load-receiving element or scale is equipped with an automatic zero-tracking*

mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode.

[Nonretroactive as of January 1, 1994]

(Added 1993) (Amended 1996 **and 2016**)

Background/Discussion:

Recently it was discovered that there appears to be one group of people who interpret paragraph S.5.4. as saying that N is equal to the total number of ALL load cells in a scale comprised of two or more independent weighing platforms (like those commonly found in highway weigh stations), while others believe that N in the formulae contained in this paragraph refers to just the number of load cells in a SINGLE independent load receiving platform comprising part of the overall multiple-platform scale. Clarification is needed so that the interpretation of this section of the handbook remains consistent.

The submitter provided the following statements along with a presentation which is available online at **http://www.ncwm.net/meetings/interim/publication-15**.

Relationship of the Minimum Load Cell Verification Interval, V_{min} , with the Scale Division, d, in Scales Comprised of Multiple Independent Load-Receiving Elements

Over the years, industry and weights and measures officials have held different opinions regarding the relationship of the minimum load cell verification interval, v_{min} , to the scale division, d, when the weighing system is comprised of multiple independent load-receiving elements. There are those who feel that only the number of load cells used in each SINGLE load receiver should be used in the relationship while others feel that you should also use the total number of load cells in ALL of the independent load receiving elements comprising the scale system.

Some may be confused regarding just what is the "minimum load cell verification interval, v_{min}." The majority of scales use one or more load cells where the working or measuring range of the load cell(s) is significantly less than the load cell's capacity. In these applications, the value of the load cell minimum verification interval and load cell utilization are important. The minimum load cell verification interval is defined as the smallest value of a quantity (mass) which may be applied to a load cell without exceeding the maximum permissible error. To express it mathematically, $v_{min} = E_{max} / \Upsilon$ where E_{max} is the load cell's rated capacity and Υ represents a value specified by the load cell manufacturer.

The minimum measuring range, MMR, can be found by:

$MMR = v_{min} \times n_{max} / E_{max}$ so for a Class IIIL load cell with a 50,000 lb capacity and a 1.5 lb v_{min} the MMR is calculated as:

MMR = 1.5 lb × 10 000 divisions / 50 000 lb = 0.3 or 30 % of the cell's capacity

This minimum measuring range can be applied over any part of the measuring range between the load cell's minimum load, $E_{min,}$ and the load cell's rated capacity, E_{max}.

With this in mind in multiple load cell applications, the square root of the number of load cells, N, is used to account for the random errors found in a group of two or more load cells. That is, some load cell errors may be positive while others may be negative.

The multiple load-receiving elements are completely independent which means that they are not physically connected to adjacent load receivers and have their load cell output(s) converted to a digital value independently of the other load-receiving elements in the scale or weighing system. They have their own displayed weight value also set aside from the other displayed values. In this case, the measuring range and hence the v_{min} of the load cell(s) used in the load receiving element are also independent and separate from the

measuring range of the load cell(s) used in the other load-receiving elements. For this reason, the relationship of the minimum load cell verification interval to the scale division is independent of the same relationships in the other load-receiving elements and should therefore be determined using the number of the load cells in or the lever multiple of the single independent load receiver.

In 1990 the NCWM voted to accept a Specifications and Tolerances Committee recommendation that stated in part:

> *Multiple weighing elements (e.g., three axle-load scales permanently installed adjacent to one another or with a dead space between the weighing elements) used simultaneously to obtain a single weight in commercial applications shall be deemed to be a single system which shall meet the requirements of the applicable accuracy class.*

This recommendation stemmed from the question as to whether the total weight should be limited to 10 000 divisions and took place BEFORE the relationship of V_{min} to d was added in 1993. When this discussion took place, no consideration was given to the relationship of the minimum load cell verification to the scale division. In 1997 a footnote was added to Table 3 Parameters for Accuracy Classes in NIST Handbook 44 which states in part:

> [4] *…On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.*

This footnote concerns the maximum number of divisions for the load-receiving elements and for the summing indicator, if so equipped. It has nothing to do with the minimum load cell verification interval and its relationship to the scale division d and number of load cells in the load-receiving element, N.

It seems that a precedent was already set in 1986 with the addition of Paragraph T.N.4.1. in NIST Handbook 44. This paragraph states:

> ***T.N.4.1. Multiple Indicating/Recording Elements*** *– In the case of a scale or weighing system equipped with more than one indicating element or indicating element and recording element combination, where the indicators or indicator/recorder combination are intended to be used independently of one another, tolerances shall be applied independently to each indicator or indicator/recorder combination.*
>
> *(Amended 1986)*

Granted, this paragraph pertains to indicating elements, but the same line of reasoning applies to multiple load-receiving elements where, when the load-receiving elements are intended to be used INDEPENDENTLY of each other, tolerances and other requirements are to be applied to each individual load-receiving element.

Further still, consider three independent electromechanical load-receiving elements placed side by side and used to weigh the axles of a vehicle. Each load-receiving element has its own displayed weight. A single total weight display that takes into account rounding errors is used to display the gross weight. Assume that each load receiver has its own unique multiple. If you believe that the relationship of v_{min} to the division value, d, is to be determined by the characteristics of the whole weighing system, how then would you apply the formula in S.5.4. for load receivers with lever systems? It states:

> V_{min} d / * scale multiple

You can apply this equation to each load receiver, but how would you apply it to the whole weighing system?

Consider three independent load receivers each with its own NTEP certificate and each with its own digital indicating element and one summing device that sums their outputs taking into consideration rounding errors. This is a common type of weighing system and one that should be and is allowed by NTEP. The design of the

load receiving elements is irrelevant. It makes no difference whether they are all mechanical or electronic or a combination of the two. The important thing is that they are all NTEP certified and that the indicator that shows the sum adds no error to the weighing system. If, however, the combination of these load-receiving elements is to be considered as a single scale, then you can consider it as essentially consisting of three NTEP certified digital load cells and a summing digital indicator. The design and technology used by the load cells is again irrelevant. It is simply a scale having three load cells and an indicator. If the former configuration is used, it should not be necessary to consider the total number of load cells in the weighing system but rather to simply consider only each scale's characteristics.

Because the summed display is NOT an additional scale and has no measuring function and is simply nothing more than the mathematical sum of the individual weights, applying the v_{min} relationship to the total number of load cells in all of the load-receiving elements contained in the weighing system has no metrological basis.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting S&T Committee open hearings, the Committee acknowledged it had received a written letter in opposition to the proposal from Mr. Henry Oppermann (Weights and Measurers Consulting, LLC). A short slide presentation in support of the proposal was provided by Mr. Eric Golden (Cardinal Scale). The Committee received numerous comments in support of the proposal from industry representatives and regulatory officials alike, including Mr. Constantine Cotsoradis (Flint Hill Resources), Mr. John Lawn (Rinstrum, Inc.), Mr. Dick Suiter (Richard Suiter Consulting), Mr. Richard Shipman (Rice Lake Weighing Systems), and Mr. Nathan Gardner (Oregon). In commenting in favor of the proposal, Mr. Cotsoradis also recommended amending the proposal that the term "load-receiving element" be changed to "weighing/load-receiving element" as it is more commonly referenced. Mr. Russ Vires (Mettler-Toledo), speaking on behalf of the SMA, noted that the SMA supported the v_{min} relationship as specified in the proposal. In written comments provided to the Committee, the SMA further noted that the v_{min} relationship is a function of each individual load receiving element and not a combination of multiple load receiving elements. Once load cell signals have been digitized for a receiving element, they have no effect on the adjacent receiving elements. This item is a technical clarification of the v_{min} relationship and does not affect other NIST Handbook 44 scale requirements.

Ms. Tina Butcher (NIST, OWM) commented it is OWM's belief that the changes proposed by this item are to address a particular multi-platform vehicle scale system that is unable to comply with the existing v_{min} formula specified in Scales Code paragraph S.5.4. It has been reported that this devices' failure to comply with the formula is due to the type and capacity of the load cells used throughout. To OWM's knowledge, there has been no evidence provided thus far to suggest that other multi-platform systems of same or similar configuration cannot comply with the formula. This leads OWM to question the rationale of changing an existing requirement to satisfy the needs of one design, when possibly all others are able to comply with the existing requirement.

The 1990 S&T Committee was asked to provide an interpretation of NIST Handbook 44 requirements to multi-platform vehicle scales consisting of three or more individual weighing elements used simultaneously to obtain a gross weight for commercial transactions. The individual weighing elements are used to obtain axle-load weights to determine compliance with highway laws and, because the entire vehicle is weighed as a single draft, the summed weight may be used for commercial transactions.

The 1990 S&T Committee recommended that multiple weighing elements (e.g., three axle-load scales permanently installed adjacent to one another or with a dead space between the weighing elements) used simultaneously to obtain a single weight in commercial applications be deemed to be a single system which shall meet the requirements of the applicable accuracy class. The classification of a scale or weighing system into an accuracy class should be based upon its application and method of use, not on the design of the device. The Committee noted that the significance of this interpretation is that not only must each independent weighing device meet the requirements of NIST Handbook 44, but the entire weighing system must meet all requirements that would apply if the device were a single scale.

OWM noted that the 1990 S&T Committee recommended the following criteria be applied to multiple-weighing devices interfaced with a single indicating element:

1. The number of divisions in the weight indicator displaying the summed weight of all weighing elements of a scale consisting of multiple weighing elements (weighing simultaneously) shall not exceed the maximum permitted for the accuracy class (l0 000 for class III and III L). The capacity by division must be marked on the weight display of the summing indicator.

2. Separate weight displays for individual weighing elements must have separate capacity statements. The number of divisions for each weighing element must satisfy the requirement for the number of scale divisions for the accuracy class. The scale division values for each weighing element and the weight display that is summing the weight values must be the same.

3. The capacity of the summed weight display shall not exceed the sum of the capacities of the individual weighing elements.

4. If one weighing element is overloaded and blanks out, then the summing weight display must also blank out.

5. All scale sections in the multiple weighing elements used simultaneously must agree within the absolute value of the maintenance tolerances (T.N.4.4.) as if the scale had a single weighing element.

It is not known whether the 1990 S&T Committee considered the application of the v_{min} formula when discussing this issue.

An OWM concern of larger implication than this v_{min} conflict is whether or not the weights and measures community will continue to support and officials continue to apply the criteria recommended by the S&T Committee in their 1990 Report should this item be adopted.

Mr. Richard Suiter (Richard Suiter Consulting) stated that he was a member of the 1993 S&T Committee and believes now that the Committee had "gotten it wrong." The v_{min} formula should apply to each independent weighing/load receiving element and indicator comprised of such systems when each performs its own analog to digital conversion.

Mr. Ross Andersen (New York, retired) stated he had voted in favor of the existing requirement in 1989, but believes now it was a mistake. The v_{min} formula should only apply to the independent scales in such a system since the summing indicator serves to do nothing more than sum the indications of the different platforms. He likened the operation of such a system to weighing multiple loads on a single platform and summing their weights. In the case of the multi-platform system, he stated that each independent weighing/load-receiving element and indicator should be treated and tested as a single independent scale. He acknowledged that any one of the independent platforms could be used to weigh an entire load providing the entire load fits onto that particular platform.

Mr. Rick Harshman (NIST, OWM) stated that he agreed each independent weighing/load-receiving element and indicator should be tested as a single independent scale, but there is also the need to test all three platforms as a single scale because the typical application of the system is to weigh vehicles that are distributed over all three platforms. The total weight of a vehicle is thus determined by summing the indications of the different indicators in the system, which constitutes a commercial weight and is why the 1990 S&T Committee had deemed such configurations to be a single system having to meet the requirements of the applicable accuracy class. Mr. Andersen disagreed on the need to test all three platforms as a single scale.

Mr. Gardner indicated that he supported Mr. Harshman's statement regarding the need to test the different platforms independently and also in combination, as if a single vehicle scale, but also supported the proposal as written.

An industry representative noted the existence of some mechanical lever system scales that require the use of more than one load cell to adapt them for electronic indication. This being the case, he questioned whether or not the proposed strike out portion of the equation in (b) of the proposal was appropriate. *NIST Technical Advisor's Note: It is believed that the proposed changes to the equation in (b) of the proposal were based on an assumption that all electro-mechanical scales would have only one load cell. If only a single load cell, there would be no need for "*$\sqrt{N}\,x$*" to be part of the equation because "N" is defined in the paragraph as being the number of load cells in the system and would always be 1. The square root of one is equal to one and when multiplied by the value of another factor in*

an equation will provide a product equal to that factor. Mr. Darrell Flocken (NCWM NTEP Specialist) agreed with the industry comments and suggested to Mr. Golden there be no changes proposed for that particular portion of the proposal due to the probable existence of such systems. Mr. Golden agreed and recommended the proposal be amended to reflect that there be no changes to the equation in part (b) of the paragraph.

During its work session, the Committee considered the different criteria listed in the Committee's 1990 Final Report, which the 1990 Committee had intended to be applied to such systems. Members of the current Committee concluded that the application of the v_{min} formula to scale systems such as those in which the current proposal is intended to apply had likely not been considered by the 1990 Committee. Members of the Committee agreed that the application of the v_{min} formula should, therefore, be considered a stand-alone issue, separate from any of the conditions provided by the 1990 Committee, which members of the Committee indicated they still support. The Committee agreed to amend the proposal to reflect there be no changes to part (b) as recommended by Mr. Golden and in consideration of all the comments received in support of the proposal, agreed to forward the item for vote as shown in Item Under Consideration.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee granted Mr. Eric Golden (Cardinal Scale Manufacturing) the opportunity to provide a short presentation on the merits of the item on behalf of the SMA. A copy of the slides presented by Mr. Golden have been inserted into Appendix A of this Report. Mr. Russ Vires (Mettler Toledo, LLC), speaking on behalf of the SMA, reported that the SMA supports the adoption of this item. The position of the SMA is that the v_{min} relationship is a function of each individual load receiving element and not a combination of multiple load receiving elements. Once load cell signals have been digitized for a receiving element, they have no effect on the adjacent receiving elements. This item is a technical clarification of the v_{min} relationship formula and does not affect other NIST Handbook 44 scale requirements. Eliminating inconsistencies is important in the proper application of the NIST Handbook 44 code and test procedures.

Mr. Richard Harshman (NIST, OWM) acknowledged that this is a confusing issue and that at the heart of the matter is the question of how to properly apply the v_{min} formula to multi-platform vehicle scales consisting of three or more independent weighing elements used simultaneously to obtain a gross weight for commercial transactions. The 1990 S&T Committee considered how NIST Handbook 44 requirements are intended to apply to these systems. That Committee's interpretation was that not only must each independent weighing device meet the requirements in NIST Handbook 44, but the entire weighing system must also meet all requirements that would apply if the device were a single scale. What has caused confusion is whether or not the 1990 Committee considered the application of the v_{min} formula in providing its interpretation.

Mr. Harshman reported that some who support this proposal have noted that Paragraph S.5.4. was first added to NIST Handbook 44 in 1993 and, therefore, was not a part of the S&T Committee's discussion in 1990. Mr. Henry Oppermann (Weights and Measures Consulting, LLC) has made evident in previous written comments to the Committee that v_{min} was being discussed at that time; its application to multi-platform vehicle scale systems was considered in 1989 by the NTEP Weighing Sector (WS) as evidenced by that Sector's 1989 summary report. OWM's review of that summary report confirmed the WS did consider/discuss how NIST Handbook 44 requirements should apply to these systems. Additionally, the report provides indication that the application of the v_{min} formula was part of that discussion. The report also indicates that the Sector did not reach a consensus on these issues.

NIST, OWM agrees additional clarification needs to be added to paragraph S.5.4. to make clear its application to such scale systems. As reported in its earlier analysis of this item, OWM believes the changes proposed by this item are to address a particular multi-platform vehicle scale system that is unable to comply with the existing v_{min} formula specified in Scales Code paragraph S.5.4. when the total number of the load cells for all weighing load-receiving elements in that system is inserted as a variable in the formula. It had been reported that this device's failure to comply with the formula is due to the type and capacity of the load cells used throughout. There has been no indication thus far to suggest that other multi-platform systems of same or similar configuration cannot comply with the formula when the total number of load cells for all weighing/load-receiving elements in those systems is inserted as a variable in the formula. For this reason, OWM continues to question the rationale of changing an existing requirement to satisfy the needs of one design, when possibly all others of the same design are able to comply with the existing requirement.

OWM reiterates the comment it made during the 2016 Interim meeting that a concern of larger implication than this v_{min} conflict is whether or not the weights and measures community will continue to support and officials continue to apply the criteria recommended by the S&T Committee in their 1990 Report should this item be adopted. The SMA has stated that this item is a technical clarification of the v_{min} relationship formula and is not intended to affect other NIST Handbook 44 scale requirements. If the Committee agrees with this SMA comment and the changes being proposed are ultimately adopted, OWM encourages the Committee to provide a clear statement in its final reporting of this item reinforcing the 1990 S&T Committee's interpretation of how NIST Handbook 44 requirements are to apply to these systems.

Mr. Ross Andersen (New York, retired) indicated that he participated in the 1989 discussions that took place within the WS to determine how NIST Handbook 44 requirements should apply to these systems. There was a divide on this issue within that Sector with representatives of industry unanimously agreeing that requirements should only apply to the independent scales used in these systems and regulators contending that requirements should apply to not only the independent scales, but also, the system as a whole. Mr. Andersen stated that he believes the 1990 Committee made a mistake in its interpretation. Requirements should only apply to the individual scales used in these systems because the indicator that provides the totalized indication is not itself a scale. It serves only to sum the indications of the different scales that are part of the system. Its indication would be no different than that which would be displayed from a handheld calculator that was used to manually sum the indications of the independent scales. He also indicated that he disagreed with OWM's recommendation to the Committee to provide a clear statement enforcing the 1990 Committee's interpretation. In his view, this issue should be reopened for discussion.

Mr. Harshman responded to Mr. Andersen's comments by stating that OWM is not opposed to reopening the issue, but disagreed with the opinion that NIST Handbook 44 requirements should only apply to the independent scales used in the system and not the system as a whole.

The Committee also received comments from several state officials, voicing support for the proposal.

In discussing this issue during its work session, members of the Committee agreed that additional clarification is needed in Scales Code paragraph S.5.4. to explain how the v_{min} formula is to apply to such multi-platform vehicle scale systems. The Committee considered different configurations of multi-platform vehicle scale systems known to exist in the commercial marketplace and how the changes proposed to paragraph S.5.4. might affect the application of the V_{min} formula to these systems. It was agreed that the changes proposed by this item only address the application of the V_{min} formula to a particular configuration; that is, one in which the weighing/load receiving element of each scale in the system is independent of the others and has its own analog to digital conversion circuitry and displayed weight.

The Committee also considered the 1990 Committee's interpretation of how NIST Handbook 44 requirements are intended to apply to these systems and the SMA's comment that its proposal is a technical clarification of the v_{min} relationship formula and is not intended to affect other NIST Handbook 44 scale requirements. The Committee agreed that the 1990 Committee's interpretation of how NIST Handbook 44 requirements are to be applied to these systems is still valid today and viewed the current changes proposed by the SMA as a separate issue apart from that interpretation. The Committee believes the changes proposed by this item are appropriate and agreed to recommend the item for vote.

Regional Association Comments:
At its fall 2015 Annual Meeting, the WWMA reported that several scale companies and the SMA gave testimony in support of this item. The SMA also offered a presentation on the item clarifying their position. Written testimony in opposition to this item was submitted by Mr. Henry Oppermann (Weights and Measures Consulting). The WWMA S&T Committee agreed with the concept as proposed and forwarded this item to the NCWM, recommending that it be a Voting item.

The CWMA, at its 2016 Annual Meeting, forwarded this item to NCWM and recommended that it be a Voting item.

NEWMA recommended the item for vote at its fall 2015 Interim Meeting. At its spring 2016 Annual Meeting, NEWMA reported it believes that the proposal will clarify the correct application of the V_{min} formula to

multi-independent platform vehicle scale systems equipped with a totalized indicator. NEWMA again forwarded the item to NCWM, recommending it for Vote.

At its 2015 Annual Meeting, the SWMA grouped this item with another new item during the open hearings and both items were heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Based on the discussion during the open hearings the Committee decided to recommend moving this item forward as a Voting item. The SWMA forwarded this item to NCWM, recommending that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

320-3 V N.1.3.3.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales and N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales.

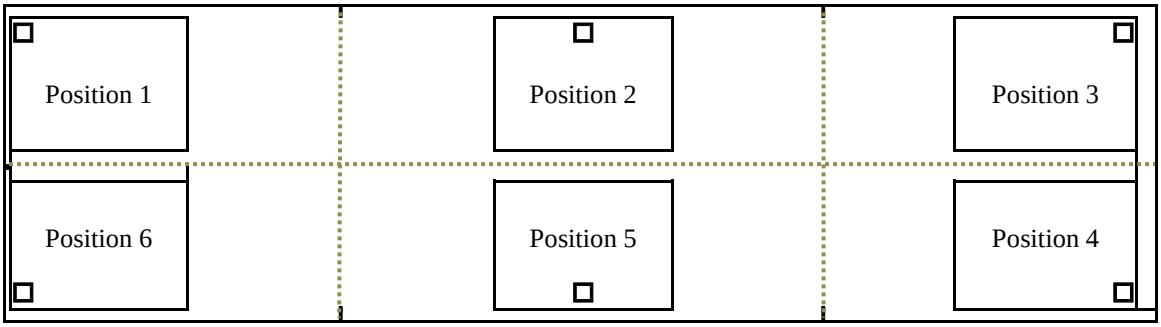
(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Eliminate inconsistencies in the shift test procedures for two-section livestock scales in the Scales Code of NIST NIST Handbook 44.

Item under Consideration:
Amend NIST NIST Handbook 44 Scales Code as follows:

N.1.3.3.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. – A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. ~~**(Two-section livestock scales shall be tested consistent with N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.)**~~



N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales. – A shift test shall be conducted using the following prescribed test loads and test patterns, provided**: When a single field standard weight is used, the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-**

receiving element. **~~t~~T**he shift test load **~~does~~ shall** not exceed one-half the rated section capacity or one-half the rated concentrated load capacity whichever is applicable, using either:

(a) a one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 1; or

(b) a one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 2.

(Added 2007) **(Amended 2016)**

Background/Discussion:
The prescribed test patterns and test loads for conducting a shift test on two-section livestock scales are specified in paragraph N.1.3.3.3. However, the last sentence (appearing in parenthesis) of paragraph N.1.3.3.2. specifies that two-section livestock scales are to be tested consistent with paragraph N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. The test loads and test procedures specified in paragraph N.1.3.7. are not consistent with those specified in paragraph N.1.3.3.3. NIST, OWM believes that the test patterns and test loads specified in paragraph N.1.3.3.3. are correct and for this reason the last sentence appearing in paragraph N.1.3.3.2. should be deleted.

NIST, OWM notes that paragraph N.1.3.3.3. was first added to NIST Handbook 44 in 2008 (adopted by the NCWM in 2007) to address the test patterns and test loads that apply to shift tests conducted on two-section livestock scales. Previous to this paragraph being added, the test patterns and test loads that applied to section tests of two-section livestock scales were specified in paragraph N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, which is now paragraph N.1.3.7. OWM also notes that the sentence proposed for deletion in paragraph N.1.3.3.2. already existed in the Handbook prior to 2008 (e.g., in the 2007 version of NIST Handbook 44, it appeared in paragraph N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales, which is now paragraph N.1.3.3.2.).

NIST, OWM believes it is likely that the sentence proposed for deletion in existing paragraph N.1.3.3.2. was purposely left remaining by the 2007 S&T Committee to capture that part of N.1.3.7. intended to eliminate instances where test weights are concentrated in a pattern that overload the load-bearing points (e.g., when multiple test weights are stacked, resulting in the test load being concentrated in a small area of the platform). In support of this notion, OWM notes that in the 2007 S&T Committee Final Report, the Committee includes example illustrations showing acceptable and unacceptable applications of test weight to a livestock scale with a section capacity of 1000 lb. The changes OWM is proposing to paragraph N.1.3.3.3. are to incorporate that portion of paragraph N.1.3.7. into paragraph N.1.3.3.3. that OWM believes the 2007 S&T Committee wanted captured in the shift test procedures applicable to two-section livestock scales.

2016 NCWM Interim Meeting:
During the 2016 Interim Meeting open hearings, Ms. Tina Butcher (OWM) reported the purpose of this item is to eliminate a current conflict between two scales code paragraphs in NIST Handbook 44 (i.e., paragraphs N.1.3.3.2. and N.1.3.3.3.) as follows:

- The title of N.1.3.3.2. implies the paragraph is intended to apply to livestock scales *with more than two sections* and combination vehicle/livestock.
- The title of N.1.3.3.3. implies the paragraph is intended to apply *to two-section livestock scales*.
- The conflict is caused by a parenthetical statement at the end of paragraph N.1.3.3.2., which states, "Two-section livestock scales shall be tested consistent with N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers."

Ms. Butcher noted NIST, OWM's Legal Metrology Devices Program worked in consultation with GIPSA to draft the current proposal in an effort to resolve this issue.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA commented that SMA supported the item as written.

In considering this item, the Committee agreed there is an inconsistency in the current language in the two paragraphs identified by OWM and that the change proposed would properly eliminate the conflict. The Committee agreed to slightly amend the proposal editorially and present it for vote as shown in Item Under Consideration.

2016 NCWM Annual Meeting:
AT the 2016 NCWM Annual Meeting, the Committee received a recommendation from Mr. Paul Lewis (Rice Lake Weighing Systems) to replace paragraph N.1.3.3.3. of the Item Under Consideration with the following:

> **N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales. –** A shift test shall be conducted using the following prescribed test loads and test patterns. When a single field standard weight is used, it shall be placed, as nearly as possible over each main load support. When multiple field standard weight are use as the prescribed test load, the load shall be placed, as nearly as possible over each main load support in a consistent pattern throughout the test and applied in a manner that does not constitute stacking of weights. The shift test load shall not exceed one-half the rated section capacity or one-half the rated concentrated load capacity whichever is applicable, using either.

Mr. Lewis, in making the recommendation, indicated that the replacement paragraph being offered only editorially changed the wording in the paragraph of the proposal and not the intent of the paragraph.

Mr. Cary Ainsworth (GIPSA), commented that GIPSA supports the proposal as it appears in the Item Under Consideration.

Ms. Tina Butcher reiterated the comments OWM provided at the 2016 NCWM Interim Meeting as noted in the discussion above. She also noted that OWM's Legal Metrology Devices Program worked in consultation with GIPSA to draft the current proposal in an effort to resolve this conflict.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA reported that the SMA supports the adoption of this item. Eliminating inconsistencies is important in the proper application of the NIST Handbook 44 code and test procedures.

During the Committee's work session, members of the Committee considered the revised paragraph offered by Mr. Lewis as replacement to paragraph N.1.3.3.3. in the proposal. Mr. Rick Harshman (NIST, OWM), Technical Advisor to the Committee, stated that the proposed revisions to paragraph N.1.3.3.3., which appear underlined and in bold-faced print in the proposal, were copied from Scales Code paragraph N.1.3.7. The intent of adding this language to the paragraph is to provide guidance on the application of the test weight when multiple field standards are used for the prescribed test load during a shift test. Mr. Harshman indicated that he believed the revised paragraph offered by Mr. Lewis significantly changed the proposal because nowhere in paragraph N.1.3.7. (or paragraph N.1.3.3.3. in the Item Under Consideration) does it specify that the test weights cannot be stacked. Upon reviewing the two paragraphs (i.e., paragraph N.1.3.3.3. in the Item Under Consideration and the revised version offered by Mr. Lewis as replacement), Committee members agreed with OWM's assessment. Consequently, and in consideration of the comments received in support of the proposal, the Committee agreed to recommend the item for Vote with no changes.

Regional Association Comments:
At its 2015 Annual Meeting, the WWMA received comment from Ms. Tina Butcher, NIST OWM, that this change is intended to eliminate inconsistencies in NIST Handbook 44, and not intended to change the test procedure. The WWMA S&T Committee agreed that the proposal helps to clarify N.1.3.3.2. and N.1.3.3.3., and also noted there are a couple of minor editorial changes required in the proposal in N.1.3.3.3. The WWMA supports this item and forwarded it to NCWM, recommending that it be a Voting item.

The CWMA supported this item and forwarded it to NCWM, recommending at both its fall 2015 Interim Meeting and spring 2016 fall Meeting that it be a Voting item.

NEWMA reported this item has merit and that this change eliminates inconsistencies in NIST Handbook 44 as it intends. This item helps clarify N.1.3.3.2. and N.1.3.3.3. NEWMA forwarded the item to NCWM and recommended at both its fall 2015 Interim Meeting and spring 2016 Annual Meeting that it be a Voting item.

The SWMA heard comments in support of this item at its 2015 Annual Meeting. The SWMA reported it believes the recommended changes will eliminate inconsistencies in the shift test procedures for two-section livestock scales. The SWMA understands there are in fact single 10 000 lb standards in use and believes that the proposed language doesn't require the use of such single standard, but only permits use. The SWMA forwarded the item to NCWM, recommending that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

322 AUTOMATIC BULK WEIGHING SYSTEMS

322-1 D A. Application, S Specifications, N. Notes, UR. User Requirements

Source:
Kansas (2016)

Purpose:
Modernize the ABWS code to more fully reflect the types of systems in use and technology available while still maintaining the safeguards of the current code.

Item under Consideration:
Amend NIST NIST Handbook 44, 2.22. Automatic Bulk Weighing Systems Code as follows:

A. Application

A.1. General. – This code applies to ~~**automatic bulk**~~ weighing systems, ~~**that is, weighing systems**~~ **capable of**~~**adapted to the automatic**~~ **automatically** weighing ~~**of a commodity in**~~ successive drafts of **a bulk commodity without human intervention.**~~**predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.**~~
(Amended 1987)

S. Specifications

S.1. Design of Indicating and Recording Elements and Recorded Representations.

S.1.1. Zero Indication. – ~~**Provisions**~~ **An Automatic Bulk Weighing System (ABWS)** shall ~~**be made to**~~indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.

S.1.5. Recording Sequence. – ~~**Provision**~~ **An ABWS** shall ~~**be made so that**~~ **indicate** all weight values ~~**are indicated**~~ until ~~**the completion of the**~~ recording of the indicated value **is completed**.

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7. No Load Reference Values. – An ABWS shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of human intervention must be required to restart the system after it is stopped.

S.1.8. Loaded Weight Values. – An ABWS shall indicate and record loaded weight values for each weighment.

S.1.9. Net Weight Values. – An ABWS shall calculate and record net weight for each weighment.

S.1.10. Net Weight Accumulation. – An ABWS shall automatically accumulate and record the sum of all net weight values for each weighing process.

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. ~~Provision~~ An ABWS shall **~~be made to~~** clearly indicate to the operator **product flow status ~~the position of the gates leading directly~~** to and from the **~~weigh hopper~~load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition that allows product to enter or leave the load receiving element. ~~leading directly to or from the weigh hopper is open.~~**

S.3.3. Overfill ~~Sensor~~And Interference Detection.

(a) **The system must have a means to detect when ~~F~~t**he **~~weigh hopper~~load-receiving element ~~shall be equipped with an~~is** overfill**ed. When an overfill condition exists ~~sensor which will cause the feed~~product flow to the load receiving element must be stopped, ~~gate to close,~~**an alarm must activate,**~~activate an alarm, and inhibit~~** weighing **must be inhibited** until the overfill condition has been corrected**, and some type of human intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**

(Added 1993)

**(b) ~~If the system is equipped with a~~Downstream storage devices and other equipment, permanent or temporary, ~~lower garner or surge bin, that garner shall also~~ which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of human intervention is required to restart the system.~~be equipped with an overfill sensor which will cause the gate of the~~

~~**weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.**~~

[Nonretroactive as of January 1, 1998]

(Amended 1997)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic ~~**grain**~~ bulk~~-~~ weighing systems installed after January 1, 1984 **used to weigh grain**; and

UR. User Requirements

UR.4. System Modification. – **Components of** ~~**T**~~**t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.

(Amended 1991)

Background/Discussion:

The submitter provided the following points of discussion:

- There are many systems in use that don't meet the definition for a "scale" or an "Automatic Bulk Weighing System" or anything else in the Handbook. These changes will make it easier for regulators/inspectors to determine if a system should be evaluated as an "ABWS".
- The wording "automatic bulk weighing systems" should not be used in the definition of the same.
- The no load and loaded weight recordings are important, but they are specifications and should not be included in the application code.
- The current code does not clearly define at what level of automation a system would be considered an ABWS versus a scale with some accessory equipment (hopper, tank, etc.). This is an attempt to more clearly distinguish which systems should be considered ABWS's.
- Human intervention could be many things. Some examples include but are not limited to pushing a reset button, turning power off then back on, typing a password, or entering a statement into a system log. The intent with including the term "human intervention" is to not include all systems which have a high degree of automation, only the ones that cycle repeatedly and can potentially operate without anyone present to observe weighing malfunctions.
- There are many types of load receiving elements that will work with an ABWS to include but not limited to tanks and hoppers so the previous language referring to hoppers was removed and replaced with the generic but accurate term "load receiving element".
- The old language implied separate sensors (e.g., bindicators) were required. Newer systems have already bypassed the use of separate sensors and utilize the weight indications to identify an overfilled condition, similar to how the indications are used to regulate product flow into the load receiving element for some devices. Concerns for this approach have been raised for situations when an indicator is not functioning properly. That is a legitimate concern, but my reply then is: What is the backup for an indicator not indicating

properly on any other type of device? This is something we know happens with other devices and commonly may not be detected until a device inspection and test is completed. Thus, one reason routine inspections and testing are required.

- Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, and buckets. Examples would be a conveyer delivering product – in such a case the recording element should not record if the conveyer is still moving or in the case of a pneumatic transfer tube the recording element should not record if the blower forcing air through the tube is still operating. Therefore, the old language referring to gates was removed and replace with more generic terminology, which can be applied to any equipment used to control product flow not just gates.

- Many types of equipment can be used for downstream commodity storage including but not limited to hoppers, tanks, bins, flat storage, trucks, totes, rail cars and pits. The language referring to "lower garner," "surge bin," etc. has been removed and replaced with a more terms such as "downstream storage devices" to allow for all potentials types of product handling equipment.

- A downstream storage device itself may not interfere with the weighing process directly, but it also cannot create a situation in which an overfill condition or some other malfunction of the equipment interferes with the weighing process. An example would be a grain storage hopper located under a weigh hopper in a position which when grain is mounded up above the storage hopper the grain touches the bottom of the weigh hopper and interferes with the weighing process. For this example, if the storage hopper can be lowered far enough below the weigh hopper so that the mounded grain when it reaches its' maximum potential height cannot touch the weigh hopper then it would not need the capability to detect an overfill condition. The same scenario would apply to a truck parked under the load receiving element, or a conveyer under the load receiving element. Wording was added to ensure interference does not occur and if it does that the system activates controls to prevent weighment errors.

The original code was written for very specific equipment for a very specialized use. This is a fairly drastic change from the original and introduces some new terminology that may present some confusion or uncertainty to those who were fairly familiar with the existing code. Some individuals feel the proposed changes may add some uncertainty as to what systems should or shouldn't be considered an ABWS.

2016 NCWM Interim Meeting:
At the Committee's 2016 Interim Meeting open hearings, Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA commented that SMA looks forward to the further clarification of this item.

Ms. Tina Butcher (OWM) noted the single-most important factor in determining whether or not an automated weighing system needs to take into account the no-load reference and gross-load reference to determine an accurate net weight for individual drafts weighed is the system's ability to consistently return to zero following discharge of the load. This determination must be made on a case-by-case basis and will vary depending on the design of the system and the products being weighed.

OWM recognizes the need for NIST Handbook 44 to include requirements that address some ***automated*** weighing systems currently in the marketplace that, for one reason or another, fail to meet the definition of an ABWS or the application of the ABWS Code. As is the case with an ABWS, these systems are also used to weigh bulk commodities in an automatic operation. A number of these weighing systems do ***not*** consistently return to zero following discharge of a draft load due to:

- the density of the commodity being weighed and its susceptibility to cling;
- structural deformations in the load-receiving element (which trap and prevent product from being completely discharged);
- venting issues; and
- system vibration; etc.

Ms. Butcher noted, for example, that NIST, OWM is aware of *some* seed treatment systems that will automatically fill to some targeted load (preset by the system operator) by weighing multiple drafts *automatically* and *without* operator intervention. Similar automated systems used to weigh other products are also known to exist. When these systems are operational, not all of the weighed product necessarily gets discharged with the draft load. The remaining product is typically referred to as a "heel." Some of these systems only record the gross weight of the different drafts weighed; yet, the "heel" remaining for each draft load cycled through the system needs to be taken into account for an accurate determination of the net quantity to be made. OWM believes this proposal is an attempt to address such systems. Ms. Butcher also acknowledged the existence of weighing systems that ***do*** consistently return to zero following discharge of the product when being operated in automatic mode. She stated that for these systems, the Scales Code is intended to apply.

Ms. Butcher further reported that OWM believes more work is needed to develop the proposal. She suggested that the submitter might propose that the definition of "automatic bulk weighing systems" be amended to apply to systems that weigh bulk commodities in an automatic operation, but because of their design, fail to meet the current definition and the existing code. Proposed amendments to the ABWS Code could then be developed to address such systems.

Mr. Doug Musick (Kansas) noted that the current proposal is an initial attempt to update the current ABWS Code to address some newer automated weighing systems known to exist in the marketplace. He reported that some of these newer systems are not able to comply with the existing ABWS Code, which provides indication of the need to update the current code. He agreed with OWM that more work was needed to further develop the proposal and requested additional input and assistance from those willing to provide it.

The Committee agreed that more work was needed to develop the item and assigned it a Developing status. The Committee recommends that the item's submitter review the 2015 SWMA S&T Annual Report for additional proposed revisions to the proposal by that region's S&T Committee.

2016 NCWM Annual Meeting:
During its 2016 NCWM Annual Meeting open hearings, the Committee received an update on this item from Mr. Doug Musick (Kansas). Mr. Musick reported that work on the proposal is ongoing and he soon planned to submit an updated version of proposal to the Committee. He reiterated a comment made at the 2016 Interim Meeting that the proposal is an attempt to update the current ABWS Code to address some newer automated weighing systems known to exist in the marketplace today that aren't able to comply with the existing ABWS Code.

Ms. Tina Butcher, (NIST, OWM) stated that OWM looks forward to being able to review an updated proposal to "modernize" the ABWS Code to more fully reflect the different types of systems currently in the marketplace. OWM noted in earlier comments that it recognizes the need for NIST Handbook 44 to include requirements that address some automated weighing systems currently in the marketplace that, for one reason or another, fail to meet the definition of an ABWS or the application of the ABWS Code, yet, are being used to weigh bulk commodities in an automatic operation. When operated in an automatic mode, a number of these weighing systems do not consistently return to zero following discharge of a draft load. OWM believes this proposal is an attempt to address such systems.

Mr. Russ Vires (Mettler- Toledo, LLC), speaking on behalf of the SMA reported that the SMA takes no position on this item at this time and looks forward to future analysis from OWM.

In consideration of the comments received, the Committee agreed to recommend this item move forward as Developing to allow for additional time to fully develop the proposal.

Regional Association Comments:
The CWMA did not consider this item at its fall 2015 Interim Meeting due to time constraints. At its spring 2016 Annual Meeting, the CWMA reported that it believes this item has merit and recommended it be forwarded to the NCWM as a Developing item.

NEWMA recommended at both its fall 2015 Interim Meeting and spring 2016 Annual Meeting that the item a Developing item citing the need for additional work.

The SWMA received comments regarding potential unintended consequences as well as editorial changes the Committee considered necessary. Comments have been provided to the submitter by a member and the Committee looks for further development of the item. The SWMA forwarded the item to NCWM with recommended changes shown below and recommended that it be a Developing item.

A. Application

A.1. General. – This code applies to ~~automatic bulk~~ weighing systems, ~~that is, weighing systems~~ capable of~~adapted to the automatic~~ automatically weighing ~~of a commodity in~~ successive drafts of a **~~bulk~~** commodity without **operator ~~human~~** intervention.~~predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.~~

(Amended 1987)

S. Specifications

S.1. Design of Indicating and Recorded Representations.

S.1.1. Zero Indication. ~~– Provisions~~ An **automatic bulk weighing system ~~Automatic Bulk Weighing System (ABWS)~~** shall ~~be made to~~indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.

S.1.5. Recording Sequence. – **~~Provision~~ An automatic bulk weighing system ~~ABWS~~** shall **~~be made so that~~ indicate** all weight values **~~are indicated~~ until ~~the completion of the~~** recording of the indicated value **is completed**.

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7. No Load Reference Values. – An **automatic bulk weighing system ~~ABWS~~ shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of operator ~~human~~ intervention must be required to restart the system after it is stopped.**

S.1.8. Loaded Weight Values. – An automatic bulk weighing system ~~ABWS~~ shall indicate and record loaded weight values for each weighment.

S.1.9. Net Weight Values. – An **automatic bulk weighing system ~~ABWS~~ shall calculate and record net weight for each weighment.**

S.1.10. Net Weight Accumulation. – An automatic bulk weighing system ~~ABWS~~ shall automatically accumulate and record the sum of all net weight values for each weighing process.

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. – **~~Provision~~** An **automatic bulk weighing system ~~ABWS~~** shall **~~be made to~~** clearly indicate to the operator **product flow status ~~the position of the gates leading directly~~** to and from the **~~weigh hopper~~load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition that allows product to enter or leave the load receiving element. ~~leading directly to or from the weigh hopper is open.~~**

S.3.3. Overfill **~~Sensor~~And Interference Detection.**

(a) **The system must have a means to detect when ~~T~~the ~~weigh hopper~~load-receiving element ~~shall be equipped with an~~is** overfill**ed. When an overfill condition exists ~~sensor which will cause the feed~~product flow to the load receiving element must be stopped, ~~gate to close,~~an alarm must activate,~~activate an alarm, and inhibit~~ weighing must be inhibited** until the overfill condition **has been** corrected**, and some type of operator ~~human~~ intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**

(Added 1993)

(b) **~~If the system is equipped with a~~Downstream storage devices and other equipment, permanent or temporary, ~~lower garner or surge bin, that garner~~ ~~shall also~~ which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of operator ~~human~~ intervention is required to restart the system.~~~~be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.~~**

[Nonretroactive as of January 1, 1998]

(Amended 1997)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic **~~grain~~** bulk**~~-~~** weighing systems installed after January 1, 1984, **used to weigh grain**; and

UR. User Requirements

UR.4. System Modification. – **Components of ~~T~~t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.

(Amended 1991)

322-2 W N.1. Testing Procedures. and T. Tolerances

(This item was Withdrawn.)

Source:
Oregon (2015)

Purpose:
Modify the test method to reflect as-used dynamic conditions.

Item under Consideration:
Amend NIST Handbook 44, Automatic Bulk Weighing Systems Code as follows:

N.1.4. Material Tests. – Procedure

1. **Start up the automatic bulk weighting system, including the surrounding equipment, which is normally in use when instrument is itself in use.**

2. **Run the system for five weigh cycles (or more if necessary) to ensure normal working conditions.**

3. **Halt the automatic bulk weighting system and record the indication of total mass.**

4. **Run the weighing for not less than five cycles at maximum capacity, minimum capacity and one close to minimum totalized load.**

5. **Halt the automatic bulk weighing system and record the indication of total mass after each run.**

6. **Determine the material test error from the difference between the indicated totalized mass and the total mass of material as determined on the reference scale.**

Either pass a quantity of pre-weighed material through the Automatic Bulk Weighing system in a manner as similar as feasible to actual loading conditions, or weigh all material that has passed through the Automatic Bulk Weighing System. Means for weighing the material test load will depend on the capacity of the system and availability of a suitable reference scale for the test. To assure that the test load is accurately weighed and determined, the following precautions shall be observed:

(a) The containers, whether railroad cars, trucks, or boxes, must not leak, and shall not be overloaded to the point that material will be lost.

(b) The actual empty or tare weight of the containers shall be determined at the time of the test. Stenciled tare weight of railway cars, trucks or boxes shall not be used. Gross and tare weights shall be determined on the same scale.

(c) When a pre-weighed test load is passed through the scale, the loading system shall be examined before and after the test to assure that the system is empty and that only the material of the test load has passed through the scale.

(d) Where practicable, a reference scale should be tested within 24 hours preceding the determination of the weight of the test load used for a Automatic Bulk Weighing System material test.

A reference scale which is not "as found" within maintenance tolerance should have its accuracy re-verified after the Automatic Bulk Weighing System test with a suitable known weight load if the "as found" error of the Automatic Bulk Weighing System material test exceeds maintenance tolerance values.*

(e) If any suitable known weight load other than a certified test weight load is used for re-verification of the reference scale accuracy, its weight shall be determined on the reference scale after the reference scale certification and before commencing the Automatic Bulk Weighing System material test.*

(f) The test shall not be conducted if the weight of the test load has been affected by environmental conditions.

*Note: Even if the reference scale is within maintenance tolerance it may require adjusting to be able to meet paragraph N.1.4.1. Accuracy of Material.

N.1.4.1. Accuracy of Material. – The quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 1/3 of the smallest tolerance to be applied. Scales typically used for this purpose include Class III and III L scales or a scale without a class designation as described in NIST Handbook 44, Section 2.20., Table T.1.1. Tolerances for Unmarked Scales.

N.1.4.2. Associated Equipment. – All associated equipment in local vicinity shall be in operation at time of test. This would include items such as conveyors; tote dumps, cleaning drums, rock separators, etc.

~~**N.1.4.**~~ **N.1.5. Zero-Balance or No-Load Reference Value Change Test.** – A test for change of zero-balance or no-load reference value shall be conducted on all scales after the removal of any test load. The change shall not be more than the minimum tolerance applicable.

~~***N.1.5.***~~ ***N.1.6. Discrimination Test.*** *– A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at zero-load and at maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained. [Nonretroactive as of January 1, 1986]*

~~**N.1.5.1.**~~ **N.1.6.1. Digital Device.** – On a digital device, this test is conducted from just below the lower edge of the zone of uncertainty for increasing-load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.

(Added 1987)

T.3. Basic Tolerance Values.

T.3.2. For Systems Used to Weigh Grain. – The basic maintenance tolerance shall be 0.1 % **and apply to both the** test load and **material test**.

T.3.3. For All Other Systems. – The basic maintenance tolerance shall be 0.2 % **and apply to both the** test load **and material test**.

(Amended 1986)

T.5. Repeatability.

T.5.1. Static Test Load. – The results obtained by several weighings of the same load under reasonably static test conditions tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

(Added 1986)

T.5.2. Material Test. – **variation in the values obtained during the conduct of material tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.**

Background/Discussion:
Based on feedback from the previous year, the State of Oregon has submitted this modified proposal to be more consistent with OIML.

The purpose of this proposal is to change the test and tolerances to reflect the way these devices are actually used. These are not "static" devices. They are "dynamic." Being dynamic they have many additional factors affecting their accuracy compared to static devices. Some of these additional factors are: timing of flow controls and conveyors, additional vibration from system while trying to capture weight, operation of software, characteristics of materials being weighed, environmental situations.

While evaluating Automatic Bulk Weighing Systems in the State of Oregon, it was found that devices meeting static testing tolerances were in fact weighing with errors as high as 6 %. Through investigation it was found that a high percentage of the Automatic Bulk Weighing Systems in the state were in fact weighing in error when operating in their normal dynamic mode. These same devices would have received approval using only static methods. Oregon reported in September 2015 that it continues to find issues with these devices, which are not directly related to static calibration of the devices. Each new installation is initially static tested to establish a base line and then approved or disapproved based on the outcome of the material test.

The fundamentals of testing call for "testing as used." This proposal lays out a method to do exactly that "test as used." Some facilities may find it difficult to accommodate the material test method. There may be substantial cost in restructuring facilities to allow for either the capture or introduction of test material. Furthermore, adopting this proposal would align with another dynamic device type; Belt Scales, NIST Handbook 44, Section 2.21.

See the 2015 S&T Committee Final Report for additional details and background information on this issue.

2016 NCWM Interim Meeting:
During the 2016 NCWM Interim Meeting, the Committee received comments from the submitter of the item and others suggesting the item had been sufficiently developed and was ready for Vote. Mr. Nathan Gardner (Oregon) stressed the need for conducting a material test (in addition to a static test) on ABWS by explaining that these systems are used to weigh bulk material in multiple drafts as the material is dynamically run through the system. He indicated these systems need to be tested as they are used; that is, by using reference material of known value and running it through the system in a material test. He further evidenced the need to perform a material test on ABWSs by noting that belt-conveyor scale systems are used to weigh material dynamically and the accuracy of these systems are verified using material tests. Mr. Gardner assured everyone that if they were not performing material tests on these systems, large errors were going unnoticed. He indicated that the problems discovered in Oregon involved all products; fish being probably the worst. He also indicated that Oregon rejects a high percentage of ABWS even after a service company believes they have adjusted them correctly. With regard to whether a material test should be an optional test, Mr. Gardner reported that Oregon would be willing to entertain the idea of making it an optional test.

Ms. Tina Butcher (NIST, OWM) reported that OWM continues to believe a material test may have merit and that the additional detail provided by the State of Oregon regarding the proposed test procedures was appreciated. Although the original proposal to add a material test to the ABWS had been amended to address some of the earlier comments and recommendations provided by OWM and others at the 2015 NCWM Interim and Annual Meetings, further refinement was still needed. Some remaining and additional concerns are as follows:

- It may not be practical to perform a material test on all ABWSs due to the large capacities of some systems and/or the types of commodities weighed.

- It should be specified whether or not the material test is mandatory or optional and if optional, under what conditions is it optional.

- The test procedures in the current proposal are difficult to follow. For example:

  - It seems that Steps 1 and 2 are performed to warm up the system (i.e., "to ensure normal working conditions"). Step 3 gives the impression that something was done in Step 2 that establishes the test load, yet it is not clear if that is actually the case given that the system was run for five weigh cycles.

  - NIST, OWM wants clarification on why a warm up is needed considering that a warm up is not typically performed before using the system for commercial transactions.

  - How and when is the weight of the reference material being determined?

  - A "weigh cycle" needs to be defined.

  - Maximum capacity, minimum capacity, and minimum totalized load need to be explained. These markings are not required on an ABWS and will not likely be understood. To the point, is "maximum capacity" the nominal capacity of the hopper (See definition of "nominal capacity, hopper scale" in NIST Handbook 44) or the amount of product in weight that the hopper will hold when full?

  - In Step 5, what constitutes a "run"? Is it five cycles?

  - Some of the individual items under proposed paragraph N.1.4. might be better suited for an EPO, rather than part of the Notes Section of the code.

- Might the proposed requirements be reorganized so they can be more easily followed?

- With respect to the weighing of the reference material, it needs to be specified that when the weight of the reference material is determined (i.e., by weighing it when loaded onto a vehicle), the vehicle shall only be weighed as a single draft. This is important because UR.3.3. Single-Draft Vehicle Weighing only applies to vehicle scales. It is assumed that there will be occasions when reference material will need to be weighed on railroad cars. Railroad track scales can be used to weigh cars in multiple drafts. If the weight of the reference material is determined by split weighing the car containing it, it will likely not be accurate enough to use as a standard in testing.

- Is a repeatability test using material really needed if it has already been proven that the scale repeats when tested statically? If it is determined that a repeatability test is also to be conducted using material, additional guidance on how to perform the test is suggested (e.g., using same test load, etc.).

Ms. Butcher also asked if members of the National Industrial Scale Association (NISA) might be consulted and requested to assist in the final development of this proposal. NIST, OWM believes that a number of its members might have an interest in this work and they may be willing to share their expertise.

Mr. Gardner indicated the State of Oregon would be willing to work with NIST, OWM to resolve any conflicts and that the test procedures in the proposal for conducting a material test had been developed from the OIML standard that applies to automatic bulk weighing systems.

Mr. Richard Suiter (Richard Suiter Consulting) commented that a key issue to conducting a material test is having a suitable reference scale available to weigh the material and getting the reference test load correct. He noted that officials may experience better success by weighing the material on a reference scale after completing the material test. He further stated that if using material normally weighed through the ABWS, one may not be able to return the product.

Mr. Doug Musick (Kansas) commented that the State of Kansas would support adding a material test to the ABWS Code providing the test is optional.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA can support this item if the following three issues discussed in the S&T Report from the 2016 Interim Meeting are incorporated in the proposal before the July Annual Meeting:

- Reorganize the requirements in the proposal so they can be more easily followed;
- Improve the understanding of the test procedures; and
- Recognize that a material test would be optional and conducted at the discretion of the official.

During the Committee's work session, several members of the Committee acknowledged that OWM had indicated the proposal needed additional refinements. The Committee, however, also recognized an urgency to act quickly on this issue given Oregon's testimony regarding the possibility of large errors going unnoticed and the size of some of errors that had been reported. It was mentioned that Oregon had indicated a willingness to work with OWM to resolve any concerns. Mr. Gardner, who was in attendance, reaffirmed his agreement to work with OWM, and Mr. Rick Harshman (OWM Technical Advisor) acknowledged agreement to work with the State of Oregon to try and develop a final proposal that could be considered at the Annual Meeting. Consequently, the Committee agreed to present this item for Vote at the Annual Meeting with the understanding there would be some additional changes likely made to:

- reorganize the requirements in the proposal that they can be more easily followed;
- improve understanding of the test procedures; and
- recognize that a material test would be optional and conducted at the discretion of the official.

The Committee also agreed that it would downgrade the status of the item at the Annual Meeting if the changes noted could not be completed and a final amended version of the proposal posted on the NCWM website well in advance of the Annual Meeting to allow ample time for review and consideration by the voting membership.

2016 NCWM Annual Meeting

At its 2016 NCWM Annual Meeting open hearings, the Committee heard an update on this item from its submitter, Mr. Nathan Gardner (Oregon). Mr. Gardner reported that Oregon had revised the proposal since the 2016 Interim Meeting to address many of the concerns that had been identified at that meeting. He noted that although there still may be some gaps in the proposal, Oregon prefers the procedures be added to the ABWS Code so that other states too can begin performing the material test, which would be of great benefit given the large errors discovered by Oregon in tests it conducted.

The Committee also heard comments from Mr. Richard Harshman (NIST, OWM) suggesting the need for additional refinement to the proposal. Mr. Harshman questioned whether or not the Committee might be trying to move forward too quickly on the proposal before it has been adequately developed.

Mr. Harshman reported that during the 2016 Interim Meeting, the Committee agreed to assign a Voting status to this item with the understanding additional changes would likely be made by the submitter to address concerns OWM had expressed at that meeting. Mr. Harshman noted that OWM reviewed a revised proposal it received from the submitter in May 2016. That proposal addressed many of OWM's concerns; however, in reviewing the proposal, OWM identified a couple of significant gaps that still needed to be addressed as follows:

a. There is no "Notes" paragraph included in the proposal specifying the conditions in which repeatability tests are to be performed (e.g., at or near the same test load, at the same flow rate, etc.,). The proposal includes a repeatability tolerance (proposed paragraph T.5.2.) but no corresponding "Notes" paragraph to specify how repeatability tests are to be performed.

b. There is no minimum test load specified in the proposal. That is, the proposal does not specify how much material needs to be run through the system for a material test in order to be considered a valid test.

Upon completion of its review of the revised proposal, OWM contacted the submitter and explained that these gaps were not discovered in its earlier review of the proposal, but were made evident by OWM's evolving understanding of the proposed procedures and how a material test might be performed on an ABWS. OWM believes these gaps can be eliminated over time fairly easily through the development of a small number of new paragraphs. There are also some additional, less significant "cleanups" that can be made to the proposal that would improve understanding.

Mr. Harshman noted that OWM appreciates the submitters urgency in wanting to add requirements and test procedures for a material test into the ABWS Code, but more importantly than getting them added quickly is that they be unambiguous and easy to follow so that they can be applied consistently. This should be an underlying consideration for any requirement proposed for addition to the handbook. Mr. Harshman further stated that the current testing procedures in the ABWS Code do not preclude officials from performing a material test if they believe such testing is needed to confirm the accuracy of the system under normal, automatic operation, or when investigating a consumer complaint.

As a final comment, Mr. Harshman reported that NIST, OWM prefers there be additional stakeholder involvement in the development of the requirements and procedures, which will serve to better ensure they are appropriate. As suggested in earlier OWM comments, might the National Industrial Scale Association (NISA) be consulted and asked to assist? OWM believes a number of its members might have an interest in this work and may be willing to share their expertise.

Ms. Kristin Macey (California) commented that California would also prefer there to be added stakeholder involvement in the development of the procedures for the material test.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) commented that the objective of the material test is to determine accuracy of the device under actual conditions of use. He questioned how all of the dynamic factors are being addressed by the current static test procedures and noted that a fundamental principle of weights and measures is to test a device as it is used.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, stated that the SMA can support this item providing the following issues discussed in the 2016 S&T Interim Report from the 2016 are incorporated in the proposal:

1. reorganize the requirements in the proposal so they can be more easily followed;

2. improve the understanding of the test procedures; and

3. recognize that a material test would be optional and conducted at the discretion of the official.

During the Committee's work session, Mr. Gardner, who was in attendance, was asked by a Committee member what action he preferred the Committee take on the proposal. He indicated that he preferred the proposal be presented for Vote. Members of the Committee were then asked to provide an indication of whether or not they agreed that the item should be presented for vote. A Committee member questioned which proposal would be presented for vote (i.e., the proposal shown in the Item Under Consideration of NCWM Publication 16 or the revised proposal that Mr. Gardner had submitted to OWM in May 2016, which had also been shared with the Committee). It was agreed that the proposal in NCWM Publication 16 would need to be presented for Vote because the revised proposal had not been made available to members of the NCWM for review. Mr. Gardner was then asked again, the action he preferred the Committee take, given this new revelation that the proposal to be presented for Vote would be Oregon's original proposal; which appears in the Item Under Consideration in NCWM Publication 16. He again indicated that he preferred the item be presented for Vote. Members of the Committee were then asked again to provide an indication of whether or not they agreed that the item should be presented for Vote. The majority of members indicated their desire to present the item for Vote and so it was decided, although the decision was not to be final.

The Committee was asked to revisit the item at the request of Mr. Richard Harshman (NIST Technical Advisor to the Committee) when it met the next day to conclude its work session. Mr. Harshman explained to the Committee that during the previous evening, he had again reviewed the original proposal and was unable to follow the different steps

outline in proposed paragraph N.4.1. Material Test; nor was it clear to him the purpose of some of those steps. He asked members of the Committee to review those steps to determine if they too had difficultly following them. He stressed the need for officials to be able to apply test procedures consistently throughout and questioned whether this could be done based on the procedures in the proposal. He noted that the submitter had removed those steps in the revised version of the proposal based on an NIST, OWM recommendation that they be removed and developed later for inclusion into a NIST EPO. Removing them from the proposal would also expedite getting a final proposal developed and presented to the NCWM for consideration. He indicated too that there were gaps in the proposal; one of them being that there is a repeatability tolerance specified under the Tolerances Section of the proposal and not a corresponding "Notes" paragraph to provide instructions on how to perform the test. He asked the Committee to reconsider its decision to present the item for vote given these concerns; noting that if he couldn't understand how to apply the test procedures, it is likely that field officials too will have difficulty understanding how to apply them. He stated that the OWM comments provided during the Committee's 2016 open hearings were based on the revised proposal Oregon had sent to OWM in May. The revised proposal includes improvements that were made by the submitter to the original proposal.

Following Mr. Harshman's explanation and the resulting discussions that ensued, Mr. Mahesh Albuquerque (Chair of the Committee) again requested a Vote on whether the item should move forward for Vote or be downgraded and returned to the submitter for further development. The majority of the Committee members voted in favor of downgrading the status of the item to Developing to provide additional time for the submitter to address the remaining concerns.

Upon learning of the Committee's decision to downgrade the status of the item to Developing, Mr. Gardner requested Mr. Albuquerque Withdraw the item.

Regional Association Comments:
The WWMA heard testimony from two regulators in support of this item at its 2015 Annual Meeting. The WWMA S&T Committee sees merit in this proposal and agrees that a dynamic test is appropriate for this type of weighing device. The WWMA recommended that this be a Voting item.

At its fall 2015 Interim Meeting, the CWMA reported it believes this item should be amended to allow regulatory officials to determine when it would be necessary. The CWMA recommended the item remain as an Information item. At its spring 2016 meeting, the CWMA reported that it would consider the item fully developed and would support it as a Voting item providing the following three issues discussed in the S&T Report from the 2016 NCWM Interim Meeting are incorporated in the proposal before the July Annual Meeting:

1. reorganize the requirements in the proposal so they can be more easily followed;

2. improve the understanding of the test procedure; and

3. recognize that a material test would be optional and conducted at the discretion of the official.

At its fall 2015 Interim Meeting, NEWMA reported it believes this item has merit and supports it but does not believe it is ready for a Vote. NEWMA recommended that it be an Informational item. At its spring 2016 Annual Meeting, NEWMA agreed to downgrade the status of this item from Voting to Informational. This will provide the additional time necessary for OWM and the submitter to make additional changes, if needed.

The SWMA has heard several concerns during past meetings and received a written communication before this meeting expressing concerns over the proposed procedures. The SWMA recommended that this item remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

325 WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

325-1 I A. Application. and Sections Throughout the Code to Address Commercial and Law Enforcement Applications

Source:
Rinstrum, Inc. and Right Weigh Innovations (2016)

Purpose:
To recognize a higher accuracy class and appropriate requirements in the Weighing-In-Motion Tentative Code to add commercial and law enforcement applications. In particular, scales meeting the higher accuracy classes would be permitted for use in commercial applications and for highway law enforcement.

Item under Consideration:
There is no specific proposal under consideration at this time. The submitter's original proposal has been removed from this part of the report at the submitter's request and is now included as part of the Background/Discussion for this item. The following synopsis was developed by the submitter of the item following the 2016 NCWM Annual Meeting to replace the original proposal that earlier appeared in this section of the report:

Rinstrum and Right Weigh Innovation submitted a proposal last year to modify the tentative WIM Code for Screening and Sorting. The idea was to keep all WIM applications within the same Code section of NIST Handbook 44. Rinstrum proposed to add slow-speed devices to the existing Screening and Sorting Code with two separate applications; one for commercial legal-for-trade and one for direct law enforcement. In consideration of the changes proposed, there would be three different applications covered by the same Code, which was causing some confusion. Because of the legal-for-trade application, it was suggested that that modification probably belonged in the Scales Code.

The 2016 NCWM Interim Meeting saw Rinstrum request the NCWM President to form a WIM Task Group to bring together regulators and private sector stakeholders to discuss Weigh-In-Motion technology. Rinstrum sought a Developing status so that it could maintain ownership of the proposal and continue to work on its development. A WIM Task Group has been formed, currently with 18 members representing Federal, State and Private Sector stakeholders. Technical advisors from NIST and NTEP contribute to the strength of the WIM Task Group. If you are interested in WIM technology, we will gladly add you to the WIM Task Group membership.

The WIM Task Group is conducting regular meetings and following an agenda to analyze the device performance and create suitable Code that is well reasoned and appropriate for inclusion in NIST Handbook 44. The first action of the WIM Task Group was to order an evaluation by the State of Illinois at an existing installation site to confirm the device meets Class IIIL tolerance. Next a decision was made to separate the Commercial Application from the Law Enforcement Application and to focus on the Commercial Application first. The Task Group will evaluate the requirement for use of reference test load vs. using the scale under test as a reverence. Consideration will be given to axle weight fluctuations as a result of suspension movement and what tolerance should be applied. Additional items on the agenda include the use of a single tolerance and creation of a Test Procedure and NTEP checklist. A sample of language to modify the Scales Code is currently being circulated within the Task Group for review and comments. The Task Group is engaged in this process and is thoroughly vetting the ideas and proposals presented so that it can make appropriate recommendations to the conference.

Rinstrum manufacturers the axleWEIGHr in-motion scale, which is a slow speed WIM axle scale system capable of being able to perform to within Class IIIL maintenance tolerance, according to Rinstrum. Rinstrum has indicated that the axleWEIGHr is a niche product, which creates a new segment for axle weighing devices. The axleWEIGHr calculates the GVW and weighs individual axles while a truck crosses the scale at 1-3 MPH. Rinstrum has also indicated the most common applications for its device will be

agricultural farmers, small trucking companies or manufacturers that are interested to determine GVW and axle weights before the vehicle enters the public roadway.

Background/Discussion:
The proposed requirements are based in part on requirements in OIML R 134, "Automatic instruments for weighing road vehicles in motion and measuring axle loads." Test data and experience at multiple test sites demonstrate this system can meet the performance requirements that are proposed.

The following represents the submitter's original proposal that earlier appeared as the Item Under Consideration for this item and was replaced following the 2016 NCWM Annual Meeting:

Amend NIST Handbook 44, Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening – Tentative Code as follows:

A.1. General. – This code applies to systems used to weigh vehicles~~,~~ while in motion**.**

(a) For the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.

(b) For commercial legal for trade applications.

(c) For direct law enforcement applications.

A.2. Axle-Load Scales – The requirements for axle-load scales apply to such scales in official use for the enforcement of traffic and highway laws or for the collection of statistical information by government agencies and axle-load scales that meet the requirements of the Tentative Code for commercial use.

A.~~2~~3. The code does not apply to weighing systems intended **only** for the collection of statistical traffic data.

A.~~3~~4. Additional Code Requirements. – In addition to the requirements of this code, Weigh-In-Motion ~~Screening~~ Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5.

Examples: divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Maximum Value of Division Size. – ~~The value of the system division "d" for a Class A, Weight-In-Motion System shall not be greater than 50 kg (100 lb).~~

(a) The value of the system division "d" for a Class A, Weigh-In-Motion System shall not be greater than 50 kg (100 lb).

(b) The value of the system division for "d" for a Class B or III L, Weigh-In-Motion System shall not be greater than 10 kg (20 lb).

S.1.4. Value of Other Units of Measure.

S.1.4.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.4.2. Axle-Spacing (Length). – **If applicable** ~~T~~**t**he center-to-center distance between any two successive axles shall be measured in:

(a) feet and inches;

(b) feet and decimal submultiples of a foot; or

(c) meters and decimal submultiples of a meter.

S.1.4.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.5. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105 % of the specified capacity of the load receiving element.

S.1.6. Identification of a Fault. – Fault conditions shall be presented to the operator in a clear and unambiguous means. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.

(b) The maximum number of vehicle axles as specified has been exceeded.

(c) A change in vehicle speed greater than that specified has been detected.

S.1.7. Recorded Representations.

S.1.7.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) transaction identification number;

(b) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in-motion);

(c) vehicle speed;

(d) number of axles;

(e) weight of each axle;

(f) **if applicable** identification and weight of axles groups;

(g) **if applicable** axle spacing;

(h) total vehicle weight;

(i) all fault conditions that occurred during the weighing of the vehicle;

(j) **if applicable** violations, as identified in paragraph S.2.1., that occurred during the weighing of the vehicle; and

(k) time and date.

S.1.8. Value of the Indicated and Recorded System Division. – The value of the system's division "(d)", as recorded, shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – **If applicable,** ~~T~~the instrument shall be capable of accepting user entered violation parameters for the following items:

(a) single axle weight limit;

(b) axle group weight limit;

(c) gross vehicle weight limit; and

(d) bridge formula maximum.

The instrument shall display and or record violation conditions when these parameters have been exceeded.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. – An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load receiving element (or elements) is in use.

S.4. Design of Weighing Devices, Accuracy Class.

S.4.1. Designation of Accuracy. – ~~Weigh-in-motion systems meeting the requirements of this code shall be designated as accuracy Class A.~~

(a) WIM Systems for screening and sorting, meeting the requirements of this code shall be designated as accuracy Class A.

(b) WIM Systems for commercial and law enforcement applications, meeting the requirements of this code shall be designated:

(1) Class III L for the dynamic gross vehicle weight calculations; or

(2) Class B for dynamic law enforcement applications.

Note: This does not preclude ~~higher~~ other accuracy classes from being proposed and added to this Code in the future when it can be demonstrated that WIM systems grouped within those accuracy classes can achieve the ~~higher~~ level of accuracy specified for those devices.

S.5. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1.(e)), the system shall be marked with the following information:

(a) Accuracy Class;

(b) Value of the System Division "d";

(c) Operational Temperature Limits;

(d) Number of Instrumented Lanes (not required if only one lane is instrumented);

(e) Minimum and Maximum Vehicle Speed;

(f) Maximum Number of Axles per Vehicle;

(g) Maximum Change in Vehicle Speed during Weighment; and

(h) Minimum and Maximum Load.

S.5.1. Location of Marking Information. – The marking information required in G-S.1. of the General Code and S.5. shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.5. shall be performed with a minimum of two test vehicles.

(a) The first test vehicle may be a two axle, six tire, single unit truck; that is, a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a ~~maximum~~ **minimum** Gross Vehicle Weight of 10 000 lbs.

(b) The second test vehicle shall be a ~~five axle,~~ single trailer truck with a maximum Gross Vehicle eight of 80 000 lbs.

Note: Consideration should be made for testing the systems using vehicles which are typical to the systems daily operation.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale before being used to conduct the dynamic tests.

N.1.1.2. Determining Reference Weights for Axle, Axle Groups and Gross Vehicle Weight. – The reference weights shall be the average weight value of a minimum of three static weighments of all single axle, axle groups and gross vehicle weight.

Note: The axles within an axle group weighed only as an axle group are not considered single axles.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded to 85 to 95 % of their legal maximum Gross Vehicle Weight **or as typical in normal use.** The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

~~**N.1.3. Reference Scale. Each reference vehicle shall be weighed statically on a multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances.**~~

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a certified scale to determine the Gross Vehicle Weight. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior.

(a) For law enforcement applications the reference vehicle shall be weighed on a certified multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle.

Note: If the distance to an off-site reference scale will significantly impact the accuracy of the reference weights then the scale under test may be used as the reference scale.

(b) For commercial applications for the gross vehicle weight calculations only, the reference vehicle shall be weighed statically on either the same scale, a certified multiple platform vehicle scale or a single platform vehicle scale with sufficient length to accommodate single draft weighing of the reference vehicle.

N.1.3.1. Location of a Reference Scale. – The location of the reference scale must be considered as vehicle weights will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted within 20 % **above the rated minimum and 20 %** below **the rated maximum speed limits.**

N.1.5. Test Procedures. For law enforcement scales.

N.1.5.1. Static Test Procedures. – For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to NIST Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to NIST Handbook 44 Class III L maintenance tolerances.

N.1.5.~~1~~2. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test, there will be a minimum of 20 weight readings for each single axle, axle group and gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2.

N.1.5.~~2~~3. Vehicle Position Test. – During the conduct of the dynamic testing ensure that the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor, five runs with the vehicle on the right side along the width of the sensor, and five runs with the vehicle on the left side along the width of the sensor. Only gross vehicle weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3.

N.1.5.~~3~~4. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4.

N.1.6. Test Procedure for Commercial Gross Vehicle Weight Calculation Scales.

N.1.6.1. As-Used Test Procedures. – A weighing system shall be tested in a manner that represents the normal method of operation.

N.1.6.2. Static Test Procedures. – For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to NIST Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to NIST Handbook 44 Class III L maintenance tolerances.

N.1.6.3. Dynamic Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of five runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test there will be a minimum of five weight readings for the gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on NIST Handbook 44 Class III L maintenance tolerances.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of the design principle used.

T.2. Tolerance Values for Accuracy Class A.

T.2.1. To Tests Involving Digital Indications or Representations. – To the tolerances that would otherwise be applied in paragraphs T.2.2 and T.2.3, there shall be added an amount equal to one-half the value of the scale division to account for the uncertainty of digital rounding.

T.2.2. Tolerance Values for Dynamic Load Tests for Screening and Sorting devices. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2.

Table T.2.2. Tolerance for Accuracy Class A	
Load Description*	**Tolerance as a Percentage of Applied Test Load**
Axle Load	± 20 %
Axle Group Load	± 15 %
Gross Vehicle Weight	± 10 %
* No more than 5 % of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.	

T.2.3. Tolerance Value for Vehicle Position Test. – The tolerance value applied to each gross vehicle weighment is ± 10 % of the applied test load.

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 meter (0.5 feet).

T.3. Tolerance Values for Dynamic Weighing Systems Used Commercially and for Direct Law Enforcement. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2.

Table T.3. Tolerance for Commercial and Law Enforcement Dynamic Scales.	
Load Description	**Tolerance as a Percentage of Applied Test Load**
Axle Load	**± 0.5 %**
Axle Group Load	**± 1 %**
Gross Vehicle Weight	**Class III L Maintenance Tolerance**

T.3.4. Influence Factors. – The following factors are applicable to tests conducted under controlled conditions only.

T.34.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

T.45. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed the tolerance value as stated in Table T.2.2. **or Table T.3. as applicable.**

UR. USER REQUIREMENTS

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division and minimum capacity.

UR.1.1. General. – The typical class or type of device for particular weighing applications is shown in Table 1. Typical Class or Type of Device for Weighing Applications.

Table 1. Typical Class or type of Device for Weighing Applications	
Class	**Weighing Application**
A	Screening and sorting of vehicles based on axle, axle group and gross vehicle weight.
B	**Dynamic law enforcement axle, axle group and gross vehicle weight.**
III L	**Commercial and direct law enforcement**
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.

On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.2.4. Axle-Load Scales Approaches. – At each end of an axle-load scale there shall be a straight, paved, and level approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles on the approaches throughout the weighing process.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

2016 NCWM Interim Meeting:
During the 2016 NCWM Interim Meeting, Mr. John Lawn (Rinstrum, Inc.) presented a short slide presentation on a slow speed WIM system that Rinstrum, Inc., manufactures. A copy of the slides from his presentation has been inserted into Appendix B of this report. Mr. Lawn explained that he had originally hoped the proposal could be considered for vote in 2016, but had decided to request it move forward as Developing in 2016 to allow time for Rinstrum to address some of the concerns that had been raised through the review process and to better familiarize the weights and measures community with the equipment. He also indicated that he understood the need for Rinstrum to provide data in support of their claim that the equipment is capable of conforming to the tolerances specified in the proposal. Rinstrum's plan going forward is to amend the current proposal to address all the issues and have a new proposal ready in time to be considered for Vote in 2017.

Ms. Tina Butcher (OWM) noted that the adoption of this proposal would, for the first time ever, make it permissible for WIM vehicle systems installed in the U.S. to be used not only for direct law-enforcement applications, but also for commercial applications. She further explained that while OWM encourages the expansion of the code to recognize such applications, the proposal needs to be thoroughly vetted by all the different parties affected by the changes being proposed, including (but not necessarily limited to):

- truck weight enforcement officials;
- representatives from the judicial system;
- WIM equipment manufacturers;
- weights and measures officials;
- FHWA and other transportation officials; and
- members of the trucking industry.

The submitter and others have acknowledged the proposal needs a considerable amount of additional development before it is ready to move forward for Vote. Ms. Butcher recommended the proposal remain in a Developing status until such time that the WIM WG or other representative group has reviewed and considered its merits.

Ms. Butcher further reported that in OWM's analysis of this item, there were several areas identified as needing additional development to include:

- The procedures developed by the WIM WG for establishing reference test loads for testing WIM systems used in law enforcement screening may not provide the level of accuracy needed (i.e., combined error and uncertainty less than one-third applicable tolerance) for testing commercial and law-enforcement WIMs given the more stringent tolerances proposed for these applications.
- Studies have shown that axle and tandem axle weights fluctuate depending on the positon of a truck on a scale. How will this be addressed in the procedures for establishing the reference test loads for testing axle and axle-groups?
- Under what conditions are officials willing to accept a single tolerance (i.e., Class IIIL Maintenance tolerance) for commercial applications?
- Why is there not an acceptance tolerance proposed? Is it because the amount of error in the WIM system is not expected to change as a result of routine, continued use?
- If a single tolerance is accepted, will this be limited to certain applications?

She also noted that as the proposal is further developed, additional changes to format and structure of the code may be needed to clearly delineate requirements for commercial WIM applications from those used for law-enforcement.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA reported that the SMA opposes the inclusion of these changes in the Weigh-In-Motion for Vehicle Enforcement Screening Code. The SMA supports the idea identified, but feels additional clarification and development is required.

A couple of regulatory officials commented in support of maintaining the Developing status of the proposal.

The Committee agreed with the submitter's request and recommended the item move forward as Developing.

2016 NCWM Annual Meeting:
During the Committee's open hearings at the 2016 NCWM Annual Meeting, Mr. John Lawn (Rinstrum, Inc.) reported that the current proposal is no longer being considered and that an NCWM Task Group has formed to assist in the further development of a proposal to replace it. He provided a brief update on some of the discussions that had taken place within the Task Group, which had met a day earlier. He stated that the Task Group had already agreed that the proposal needed to be changed to separate the requirements for WIM systems used in commercial application from those used for direct enforcement. He requested that the Committee replace the proposal included in the Item Under Consideration with a synopsis, which he offered to draft and provide to the Committee given that the current proposal was no longer being considered.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, stated that the SMA takes no position on this item at this time and looks forward to recommendations from the newly formed Weigh-In-Motion Task Group.

In consideration of Mr. Lawn's request to do so, the Committee agreed to replace the proposal in the Item Under Consideration with a synopsis to be developed by him. The Committee also changed the status of the item to Information because an NCWM Task Group, under the direction of the Committee, is now assisting in the development of a proposal. This change in status is an indication that the Committee has taken responsibility for the additional development of this item.

Regional Association Comments:
At its fall 2015 Interim Meeting, the CWMA heard a presentation from Mr. John Lawn of Rinstrum proposing the commercial use of weighing in-motion systems. He indicated that participants from the Western Weights and Measures Association provided good feedback for them to improve the proposal, which resulted in this new proposal. An industry consultant indicated the item could be ready for Voting status, especially since it would be considered a tentative code. Mr. Long commented that he would attend the Interim meeting and make the presentation then. The CWMA agreed that the item was sufficiently developed and forwarded it to NCWM recommending that it be a Voting item. At its spring 2016 Annual Meeting, the CWMA recommended the item be presented as a Developing Item on the NCWM Agenda, reporting that it feels this item has merit and the comments received were in support of it, but it is in need of Development.

At its fall 2015 Interim Meeting, NEWMA recommended this item as a Voting item since the code is still tentative. At its spring 2016 Annual Meeting, NEWMA recommended the item be forwarded to NCWM as a Developing item.

The SWMA reported, at its 2015 Annual Meeting, it believes this item has merit but needs further development. The SWMA forwarded the item to NCWM, recommending that it be a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

330 LIQUID MEASURING DEVICES

330-1 V S.1.6.3. Return to Zero (See Related Items 331-1 and 332-1)

(This item was Adopted.)

Source:
Maryland (2016)

Purpose:
Prohibit operation of the reset mechanism during delivery.

Item under Discussion:
Amend NIST Handbook 44, Liquid Measuring Devices Code as follows:

S.1.6.3. Return to Zero.

(a) The primary indicating elements, and primary recording elements if the device is equipped to record, shall be readily returnable to a definite zero indication. However, a key-lock operated or other self-operated device may be equipped with cumulative indicating or recording elements, provided that it is also equipped with a zero-return indicating element.

(b) It shall not be possible to return primary indicating elements, or primary recording elements beyond the correct zero position.

(c) Primary indicating elements shall not be resettable to zero during a delivery.

(Amended 1972 **and 2016**)

Background/Discussion:
While many devices include a provision to prevent the reset operation from occurring during a delivery, this language is not directly specified in all measuring codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG and NH_3 codes.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Items 330-1, 331-1, and 332-1 and comments were taken simultaneously as the Committee considered them companion items. A summary of comments heard on all three items are as follows:

Ms. Tina Butcher (NIST, OWM) offered comments intended to apply to all items in the group and to only specific items in the group. With respect to adding the sentence, "A reset mechanism…during a delivery" proposed for each code, Ms. Butcher stated OWM agrees with the proposed addition of a requirement that prohibits the operation of a zero-reset mechanism during a delivery in each of these codes. If a reset mechanism can be operated during a delivery, this may allow an inadvertent or intentional reset of the indications to zero. If such a reset occurred, it would not allow for an accurate accounting of the quantity during a delivery and may facilitate fraud. The prohibition for operating the reset mechanism while a metering system is in operation has been applied for some time during type evaluations. She noted that for additional sentence clarity, OWM suggests that the reference to a "reset mechanism" be qualified with the term "zero" to read "zero-reset mechanism."

With respect specifically to Item 331-1, Ms. Butcher indicated OWM concurs with the key points outlined in the justification for the item. Current language in NIST Handbook 44 VTM and LPG and NH3 codes specifies the operator is to reset a register to zero if it advances when initially activated. It is the responsibility of the operator to ensure the device is reset to zero prior to every operation, but in the real world, operators are often rushed and may not take time to rezero the device. Additionally, drivers are sometimes given only one delivery ticket for a customer and don't reset the indications because they can't make a delivery without a replacement ticket. She further noted that this can easily lead to facilitation of fraud. Including a specification to help ensure that the system is designed to automatically reset to zero prior to the start of a delivery would:

- help eliminate these concerns;
- improve the accuracy of transactions; and
- facilitate the delivery process for the operator.

She suggested the Committee also consider adding a new requirement to limit the quantity that can be suppressed similar to existing paragraph S.1.6.1. in the LMD code. She indicated the corresponding LMD Code paragraph S.1.6.3. Return to Zero uses a bulleted format, which may make the paragraph easier to read and apply. NIST, OWM suggests that a similar formatting be used for paragraph S.1.1.5. Return to Zero. She also suggested the Committee may want to consider adding a user requirement to the VTM Code similar to paragraph UR.3.1. Return of Indicating and Recording Elements to Zero in the LMD Code.

With respect specifically to Item 332-1, Mr. Butcher stated that NIST, OWM agrees with the proposed addition of the new paragraph addressing initial zero indications; such a requirement will help ensure that transactions start on zero with little need for operator intervention.

Mr. Ross Andersen (New York, Retired) commented "during the delivery" is not the critical part of the proposal. It is what a reset mechanism does that is critical; it is the actual function that ends the delivery. He encouraged the Committee to make sure the language makes clear that the delivery is done and the meter is reset.

Mr. Dmitri Karimov (Liquid Controls, LLC) stated he agreed with the reset mechanism portion of the proposals but that more technical work was needed on pressurization and for that reason was opposed to adding the proposed new paragraph titled "Initial Zero Indication – Electronic Devices" in 331-1 and 332-1. He noted that there is a big difference in the pressurization of a RMFD and a VTM due to hose length. There is a lot more quantity of product involved in a VTM hose in comparison to RMFD hose. There could be as much as two gallons of product in a VTM hose. Mr. Jim Petinatto (FMC Technologies) followed up by stating masking pressurization hides abuse. Masking doesn't help the operators.

Mr. Ken Ramsburg (Maryland) stated that the intent of proposal was not to mask multiple gallons, but to have the device start on zero.

During the Committee's work session, members of the Committee acknowledged there seemed widespread support to adding a sentence prohibiting the operation of a zero-reset mechanism during a delivery into each of these codes. With respect to the sentence being proposed, the NIST Technical advisor noted that during the Meter Manufacturers Association Meeting held the previous Sunday, some members of the MAA had expressed a concern with some of the language in the sentence. Members of the MAA had developed and agreed to the following preferred language to replace the sentence being proposed in each of the three codes:

Primary indicating elements shall not be resettable to zero during a delivery.

The Committee agreed that the sentence developed and recommended by the MAA was clearer and might also address the concern raised during the open hearings regarding reset being the function that ends a delivery. Consequently, the Committee agreed to replace the sentence being proposed in each of the proposals with that recommended and preferred by the MAA.

Members of the Committee also acknowledged that the comments received from industry suggested additional work was needed to develop requirements that address pressurization in both the VTM and LPG and Anhydrous Ammonia Measuring Devices codes. In consideration of the "industry" comments, the Committee agreed to delete the proposed new paragraph titled, "Initial Zero Indication – Electronic Devices" from each of these agenda items as follows:

Delete from Agenda Item 331-1:

S.1.1.6. Initial Zero Indication - Electronic Devices. – A device shall display a definite zero indication upon initial activation of the delivery mode. The measurement, indication of delivered quantity, and (for computing devices) the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero. Pressurization of any discharge hose shall not result in the register advancing beyond the initial zero indication.
[Nonretroactive as of January 1, 20XX]

Delete from Agenda Item 332-1:

S.1.4.3. Initial Zero Indication - Electronic Devices. – A device shall display a definite zero indication upon initial activation of the delivery mode. The measurement, indication of delivered quantity, and (for computing devices) the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero. Pressurization of any discharge hose shall not result in the register advancing beyond the initial zero indication.
[Nonretroactive as of January 1, 20XX]

The changes agreed to by the Committee are reflected in the Item Under Consideration for each of the three items. The Committee agreed to present each item for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 330-1, 331-1, and 332-1 and take comments on these items simultaneously. Mr. Kenneth Ramsburg (Maryland), submitter of the proposal, questioned why the pressurization paragraphs had been removed from the initial proposal. Mr. Harshman (NIST, OWM Technical Advisor to the Committee) reported that the paragraphs had been removed at the recommendation of the MMA during the 2016 Interim Meeting. The MMA had indicated to the Committee further development was needed concerning requirements addressing pressurization due to the amount of product contained in the delivery hose of a VTM (or LPG and anhydrous ammonia measuring device) in comparison to the delivery hose of a RMFD. Because of the difference in the amount of product remaining in the hose after a delivery, the MMA had concluded pressurization could not be treated the same for these devices. Mr. Ramsburg then asked when the proposals would become enforceable, if adopted. Mr. Harshman indicated they would become enforceable on January 1, 2017. Ms. Tina Butcher (NIST, OWM) noted that the portion of the proposals still remaining is retroactive and, therefore, would become enforceable with the adoption of the 2017 version of NIST Handbook 44 for each of these items.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA supported the items as drafted. He indicated that the pressurization language, which had been removed from the proposals, would cause problems for industry, if adopted. He also stated that if Maryland wants pressurization to be addressed in NIST Handbook 44, the MMA would be willing to try and develop some draft language that could be considered.

Ms. Tina Butcher (NIST, OWM) stated that OWM believes the Committee made the right decision to remove pressurization paragraphs from Item 331-1 and 332-1. She also indicated that OWM believes Maryland's initial proposal has merit and suggested that the Committee consider adding a new item to its carryover agenda for the coming NCWM cycle to address the pressurization issue.

Hearing no comments in opposition the Committee agreed to present Items 330-1, 331-1, and 332-1 for Vote; each without change as shown in Item Under Consideration. Members of the Committee were opposed to adding a new carry-over item to the Committee's agenda to address pressurization, as suggested by OWM, without the State of Maryland's commitment to finalize development of the proposal, including working with the MMA to help develop it. The Committee, not knowing whether or not Maryland intended to further pursue this issue, agreed that Maryland would be able to submit a new proposal to address this issue, should it believe such action is necessary.

Regional Association Comments:
The CWMA reported that it received no comments on this item at its spring 2016 Annual Meeting. The CWMA recommended the item move forward as a Voting Item on the NCWM Agenda.

At its spring 2016 Annual Meeting, NEWMA reported it believes this item would improve harmonization of the LMD, VTM, and LPG/NH_3 codes with other measuring device codes. NEWMA recommended forwarding this item as a Voting item to NCWM.

The SWMA, at its fall 2015 Annual Meeting grouped this item in a batch consisting of Items 330-1, 331-1 and 332-1 and all items were heard together. The Committee believes the items have merit. The SWMA forwarded the items to NCWM, recommending that they be Voting items.

330-2 V S.X.X. Card Operated Retail Motor Fuel Devices

(This item was Adopted.)

Source:
North Carolina (2016)

Purpose:
To clarify justification of testing 3-minute time out for credit card operated RMFD.

Item under Discussion:
Amend NIST Handbook 44, Liquid Measuring Devices Code as follows:

S.1.6.10. Pay-At-Pump Retail Motor-Fuel Devices. – Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes.
[Nonretroactive as of January 1, 2017]
(Added 2016)

Background/Discussion:
This paragraph represents how the feature is tested in an NTEP evaluation in accordance with the NCWM Publication 14 checklist. However, it is not clearly supported by NIST Handbook 44. General Code, paragraph G-S.2. Facilitation of Fraud is vague on this issue. There is great concern regarding the use of credit cards and the potential for accidental or intentional fraud.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Ms. Tina Butcher (NIST, OWM) commented that NTEP evaluations of card-activated retail motor-fuel systems include various tests to verify that the process of authorizing a sale with a credit or debit card doesn't allow a card to be inappropriately accessed. These tests and procedures are specified in NCWM Publication 14. The procedures include a requirement that a dispenser, having been "authorized" with a credit or debit card, must "de-authorize" if not turned on after a period of three minutes. While this situation can be and has been addressed during type evaluation through General Code paragraph G-S.2. Facilitation of Fraud, OWM believes the proposed change to the LMD Code would:

- provide specific language to help address this gap;
- improve uniformity in application; and
- provide specificity to manufacturers who are designing such systems.

Ms. Butcher noted that the Measuring Sector reviewed and refined the language in the proposal prior to its submission and that there are similar "time-out" requirements in the Vehicle-Tank Meters Code, but none currently in the LMD Code.

Ms. Butcher also reported that OWM suggests simplifying the first sentence of the proposal to read:

Once a card has been accepted and the device authorized, the device must de-authorize within three minutes if the device is not activated or there is no initial product dispensed.

Mr. Tom McGee (PMP Corporation) stated that the language in the proposal needed to be broader in terms of the activation mechanism and noted the existence of metering systems that can be activated using a cell phone and possibly other similar devices. Ms. Julie Quinn (Minnesota) stated that she supports the proposal as a Voting item and agrees that "card operated" needs to be expanded. Further, Ms. Quinn stated that three minutes is too long and should be

shortened. Ms. Fran Elson-Houston (Ohio) wondered if it was possible to add provisions requiring deactivation of the device if foreign objects (e.g., skimmers) were affixed to it.

In consideration of the Comments received during the open hearings, the Committee agreed to:

- amend the title of the paragraph to recognize additional means of activating a dispenser;
- reduce the time limit in which a dispenser would need to de-activate from three minutes to two minutes, plus make some additional amendments to the language to make it clearer; and
- add a non-retroactive enforcement date to the paragraph.

The Committee agreed to present the item, as amended by the Committee, for vote at the Annual Meeting. All the changes agreed to by the Committee are included in the proposal as shown in the Item Under Consideration.

2016 NCWM Annual Meeting
At the 2016 NCWM Annual Meeting open hearings Ms. Tina Butcher (NIST, OWM) stated the proposed change to the LMD code would provide specific language to help address intentional or inadvertent misuse of a customer's card; provide for uniformity in application; and provide specificity to manufacturers who are designing such systems. OWM also recommended that the Committee consider NEWMA's recommendation to change the time limit to three minutes as was originally proposed by the submitter.

Mr. Mike Sikula (New York) commented that there may be customers that need three minutes.

Dr. Matthew Curran (Florida) stated two minutes would help prevent fraud as three minutes was more than enough time to pull away from a dispenser and allow someone to pull up and begin fueling under activation from the previous customer.

The Committee, in consideration of the comments heard during the open hearings on two minutes versus three minutes, agreed to present Item 330-2 for Vote without change as shown in Item Under Consideration.

Regional Association Comments:
The CWMA agreed at its spring 2016 Annual Meeting to recommend the item be a Voting item on the NCWM Agenda and reported there were no comments heard on this item and that it believes the item is fully developed.

At both its fall 2015 Interim Meeting and spring 2016 Annual Meeting, NEWMA agreed to support the item and forward it to NCWM, recommending that it be a Voting item. At the NEWMA Annual Meeting, the S&T Committee heard comments in opposition to a two-minute time out and support to amend the proposal to a three-minute time out as specified in NCWM Publication 14. Consequently, NEWMA amended the time specified in the proposal for the device to de-authorize from two minutes to three minutes. The following amended proposal was forwarded to the NCWM along with the recommendation it be a Voting item:

> ***S.X.X. Pay-At-Pump Retail Motor-Fuel Devices. – Once a device has been authorized, it must de-authorize within ~~two~~ three minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than ~~two~~ three minutes.***
> ***[Nonretroactive as of January 1, 2017]***

At its fall 2015 Annual Meeting, the SWMA forwarded this item to NCWM, recommending that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

330-3 V N.4.5. Verification of Linearization Factors

(This item was Adopted.)

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To update NIST Handbook 44 to reflect the technological changes in registers for liquid measuring devices and to alert weights and measures officials to the fact that error in start-up and shut-down delivery quantities can introduce linear errors in the calibration at normal flow rates; these errors increase the further the delivered quantity deviates from the prover size used at calibration.

Item Under Consideration:
Amend NIST Handbook 44 Liquid Measuring Devices Code by adding the following:

N.4.5. Verification of Linearization Factors. – All enabled linearization factors shall be verified. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis at the discretion of the official with statutory authority.

(Added 2016)

UR.4. Maintenance Requirements.

UR.4.1. Use of Adjustments. – Whenever a device is adjusted, all enabled linearization factors shall be verified to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis.

(Added 2016)

Background/Discussion:
Wholesale metering systems are used to deliver product at many different flow rates. Many of these systems are equipped with features that allow different calibration factors to be programmed at those flow rates. Companies commonly set accuracy goals of ± 0.05 % at normal and "fallback" delivery rates; however, they are often reluctant to spend time entering different calibration factors for the initial ("start-up") and ending ("shut-down") portions of the delivery. Spending time calibrating the metering system at normal and fallback delivery rates to such a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. An additional concern is that an unscrupulous operator could use the error introduced by the start-up and shut-down portions of the delivery (if known) to adjust calibration at the normal delivery rate such that the overall error of a typical delivery is predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shutdown errors have a counter-intuitive effect. Underregistration errors (which are normally in the consumers' favor) in the start-up and shut-down portions of the delivery may actually create shortages in the total delivery if calibration of the normal rate is adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down errors are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to determine the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge. Terminals and refineries want to maximize the accuracy of their liquid measuring devices by optimizing the calibration factors at typical delivery rates.

This proposal is not intended to have any effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do use multiple calibration factors, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no

problems with this requirement by making sure that their devices are in tolerance at slow flow start-up and shut-down rates and that errors are not predominantly in one direction.

See the 2014 and 2015 S&T Committee's Annual Report regarding this item to review previous language and positions to add paragraphs N.4.2.5. Initial Verification and UR. 2.5.1. Initial Verification Proving Reports to NIST Handbook 44 Liquid Measuring Devices Code.

2016 NCWM Interim Meeting:
Agenda Item 330-3 was amended immediately prior to the 2016 NCWM Interim Meeting as a result of a Multipoint-Calibration Work Group (MPCWG) meeting held on Sunday morning, prior to the start of that meeting. The new wording eliminates the conditions when a linearization factor would need to be verified because it was agreed that such details are better suited for inclusion in training material, a NIST EPO, or other document used as a resource in understanding the different factors necessitating verification.

The new wording ensures that all factors in a meter are verified each time any meter factor is changed. Verification of a factor may take the form of a physical test at the specified flow-rate or may be an evaluation of the factor using mathematical empirical analysis to ensure that the factor is reasonable for the affected flow rate. In all cases, a physical test must be performed at one or more specified flow rates.

During the Committee's 2016 Interim Meeting open hearings, clarification was requested from the floor on how to apply factors when multiple products are involved. Ms. Julie Quinn (Minnesota), Chairperson of the MPCWG, clarified that the intent is that all factors for all products, including grades of product within a family, are to be verified anytime a change is made. However, this verification may simply be a comparison of factors used between product grades to ensure they remain consistent.

Ms. Tina Butcher (NIST, OWM) asked that be given a chance to further study the new language in the proposal. OWM would also like to see a clarification of the term "empirical analysis" and proposed that the current wording leaves too much open to interpretation. Ms. Julie Quinn agreed with the need to clarify what is meant by "empirical analysis."

Representatives from Liquid Controls and Flint Hill Resources supported the item as presented.

Based on comment received, the Committee agreed to amend the proposal as requested by the MPCWG and to present the item as shown in Item Under Consideration for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting open hearings, the Committee agreed to group together Agenda Items 330-3 and 331-4 and take comments on these items simultaneously. Ms. Julie Quinn (Minnesota), submitter of the item and Chairperson of the MPCWG, provided the Committee with a document titled, "Draft Guidance on Empirical Analysis" and stated that the document gives clarification on what is meant by "empirical analysis." It allows the weights and measures official to exercise discretion for analysis. A copy of the document has been inserted into Appendix C of this report. She also stated that the MPCWG supports the item for Vote.

Ms. Tina Butcher (NIST, OWM), in referencing previous comments offered by OWM, noted that OWM believes it is essential that physical testing be included as part of any analysis and that the changes made to the proposed language by the Committee at the 2016 Interim Meeting clarifies this point and improves the proposal. She stated that OWM acknowledges that to be able to completely verify the performance of a meter with multi-point calibration, separate tests must be performed with each product to be metered and at all flow rates and every calibration factor that has been programmed into the system for those products. This makes obvious the need to perform many tests on a single meter in order to take into account the different factors, and combinations thereof, affecting performance. The proposed "Note" and accompanying "User Requirement" in the proposal provides guidance on when verification of linearization factors needs to be done.

Ms. Butcher also stated that NIST, OWM appreciates the continued work of the group that developed this issue to create accompanying guidelines for conducting empirical analysis. She encouraged members of the NCWM to study

the guidelines and provide input to the group, with the goal of finalizing the guidance prior to the adoption and publication of the proposed language. She reported that OWM had shared the latest draft of the guidelines provided by that group with fluid metrology experts at NIST and would provide any input obtained. She also recommended that the guidelines be shared with the Measuring Sector at its 2016 meeting with a request for comments. After the group obtains and incorporates input from interested parties, perhaps the information could be made available as an appendix to pertinent NIST EPOs and/or training materials if the group is amenable. As a final comment, she noted that OWM questions whether distinctions need to be made in the guidance document with regard to guidance for service personnel versus regulatory officials.

Mr. Ross Anderson (New York, Retired) stated that the language, "at the discretion of the official with statutory authority" should be removed from the UR.4.1. section of Item 330-3 and the UR.3.1. section of Item 331-4. He noted that both are User Requirements and it would be service personnel who typically make the adjustments and perform the verifications specified in these proposed paragraphs. For this reason, the verbiage "at the discretion of the official with statutory authority" is inappropriate for this particular section of the handbook.

Ms. Kristin Macey (California), Ms. Tina Butcher (NIST, OWM) and Mr. Dmitri Karimov (MMA) support the items with the removal of "at the discretion of the official with statutory authority" from the User Requirement paragraphs of each item.

During its work session members of the Committee acknowledged hearing support for the removal of the words, "at the discretion of the official with statutory authority" from the language proposed in paragraph UR.4.1. of Agenda Item 330-3 and paragraph UR.3.1. of Agenda Item 331-4 and the Committee agreed to eliminate these words from each of these two paragraphs and to present both proposals for a vote. The following represents the changes that were agreed to by the Committee:

Amend proposed new paragraph UR.4.1. Use of Adjustments of the proposal in Agenda Item 330-3 as follows:

> **UR.4.1. Use of Adjustments. – Whenever a device is adjusted, all enabled linearization factors shall be verified to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis. ~~at the discretion of the official with statutory authority.~~**

Amend proposed new paragraph UR.3.1. Use of Adjustments of the proposal in Agenda Item 331-4 as follows:

> **UR.3.1. Use of Adjustments. – Whenever a device is adjusted, all enabled linearization factors shall be verified to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis. ~~at the discretion of the official with statutory authority.~~**

Regional Association Comments:
The WWMA reported at its 2015 fall Annual Meeting that Mr. Tina Butcher, NIST OWM, submitted minor revisions to the proposal on behalf of the submitter. The WWMA believes that this proposal has been developed enough and recommended that it be an Informational item as follows:

> **N.4.2.5. Initial Verification. – A wholesale liquid measuring device shall be tested at all flow rates and with all products for which a calibration factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.**
>
> **A wholesale liquid measuring device not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**

Example: A meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 150 gpm, a normal operating flow rate of 650 gpm, and a fall-back rate of 450 gpm. The meter is to be tested with regular gasoline at 150 gpm, 450 gpm and 650 gpm; and with premium gasoline at 150 gpm, 450 gpm and 650 gpm.

The official with statutory authority has the discretion to determine the flow rates and products at which a meter will be tested on subsequent verifications.

UR.2.5.1. Initial Verification Proving Reports. – Initial verification proving reports for wholesale liquid measuring devices equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.

N.4.5. Verification of Linearization Factors. – All enabled linearization factors shall be verified:

(a) when a device is initially being put into commercial use;

(b) when a device has been placed into service and is officially being tested for the first time;

(c) when a device is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;

(d) when a device is being officially tested for the first time after major reconditioning or overhaul; or

(e) at the discretion of the official with statutory authority.

The verification of enabled linearization factors may be done through physical testing or empirical.

UR.4. Maintenance Requirements.

UR.4.1. Use of Adjustments. – Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

At its fall 2015 Interim Meeting, the CWMA received recommendations for grammatical changes. The CWMA reported it believes that this proposal will help ensure accuracy and allow for efficient testing of these devices. The CWMA modified the item and forwarded it to the NCWM as follows with the recommendation it be presented as a Voting item:

N.4.5. Verification of Linearization Factors. - All enabled linearization factors shall be verified:

(a) when a device is initially being put into commercial use;

(b) when a device has been placed into service and is officially being tested for the first time;

(c) when a device is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;

(d) when a device is being officially tested for the first time after major reconditioning or overhaul; or

(e) at the discretion of the official with statutory authority.

The verification of enabled linearization factors maybe done through physical testing or empirical analysis.

UR.4. Maintenance Requirements.

UR.4.1. Use of Adjustments. – Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

At its spring 2016 meeting, the CWMA recommended the item be forwarded to NCWM as a Voting item, noting that the item is fully developed and comments received were in support of the item.

At its fall 2015 Interim Meeting, NEWMA reported it realizes that multi-point calibrations are not going away and need to be addressed; however, this item needs further work by the Committee to address concerns. NEWMA recommended that this item be an Information item. At its spring 2016 meeting, NEWMA agreed to forward the item to NCWM as a Voting item after indicating it received comments in support of the item.

The SWMA batched this item with Item 331-4 at its fall 2015 Interim Meeting and recommended this item remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

330-4 D Recognize the Use of Digital Density Meters

Source:
Missouri (2016)

Purpose:
Allow the use of digital density meters for inspections of meters for viscous fluids such as motor oils, diesel exhaust fluid (DEF) and antifreeze.

Item under Discussion:
Amend NIST Handbook 44, Liquid Measuring Devices Code as follows:

Develop provisions in various LMD Codes of NIST Handbook 44 that would recognize the use of digital density meters in lieu of volumetric provers, or the use of flasks and thermometers in the case of gravimetric testing) when testing meters used to dispense certain viscous fluids such as motor oil, DEF, antifreeze, syrups, etc.

"Digital density meters may be a solution for testing motor oil, DEF and anti-freeze meters."

Background/Discussion:
Current test procedures are slow and awkward due to the need of using borosilicate glassware for package checking. Digital density meters are fast; use small samples size (2 ml); and have built-in thermometers.

When conducting volumetric testing of meters used for dispensing viscous fluids such as motor oil, DEF, antifreeze, syrups, etc., air becomes entrapped in the fluid and clings to the sides of the prover which adversely affect the results of the test. In order to conduct gravimetric tests, it is necessary to determine the density of the product. Digital density meters are fast and accurate in comparison with recognized gravimetric testing procedures using flasks and thermometers. There is no need to "wet down" volumetric flasks before each measurement. Most non-food products may be recovered without contamination. Only a small sample size (2 ml) of the product is needed for testing. Using

digital density meters equipped with built-in API density tables will not require the cooling of samples to 60 °F. There is no need for a partial immersion thermometer or volumetric flasks.

Well-established ASTM and other international standard test methods are available with precision statements.

2016 NCWM Interim Meeting:
Ms. Tina Butcher (NIST, OWM) and Mr. Ross Anderson (New York, Retired) both stated they supported the concept, but questioned whether the use of density meters needed to be addressed in NIST Handbook 44. They suggested a more appropriate place might be in an EPO or other similar document. Mr. Michael Keilty (Endress + Hauser Flowtec) recommended keeping the status of this item as Developing because the direction of the item was a little unclear. Mr. Dmitri Karimov (Liquid Controls) recommended this item be Withdrawn. Based on the comments received, the Committee agreed to assign the item a Developing status.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Mr. Ron Hayes (Missouri) provided an update on the progress to develop this item and requested it remain in a Developing status to allow time to complete this work.

Ms. Tina Butcher OWM reiterated many of the comments provided by OWM at the 2016 NCWM Interim Meeting. She stated that OWM supports the concept of using digital density meters in testing of metering systems and looks forward to the further development of this item. An accurate determination of product density is essential when conducting gravimetric tests and having the facility to make this determination might encourage inspection and testing of meters that dispense products with characteristics (e.g., viscosity, corrosiveness, etc.) that may not lend themselves to testing with volumetric methods.

OWM recognizes that the item is still under development and suggests that other codes which currently reference gravimetric test procedures in NIST Handbook 44 be considered as a template. Since the "Notes" section of the LMD Code currently makes reference to test drafts in volumetric units, these paragraphs may need to be reviewed for possible revision. In addition, the Fundamental Considerations should be considered in defining the suitability criteria of any density meter used in testing. It may be that the NIST EPOs, training materials, or other guidance documents might be more appropriate place(s) to specify details regarding the selection and use of this equipment and to provide details on its specifications. An additional question to be considered is whether or not there needs to be additional criteria in laboratory metrology documents such as the NIST 105 Series handbooks or in the NIST Handbook 133 procedures for gravimetric testing.

Ms. Butcher also reported that OWM's Laboratory Metrology Program had previously conducted some testing of portable density meters in 2006. The results from that testing showed that the units don't work very well for liquids that are likely to produce air bubbles, (e.g., oils or any product with carbonation). At the time, OWM was considering their use in determining density for package checking and found that the accuracy is suspect with products that form bubbles. Further, measurements are inaccurate when there are bubbles present in the oscillating tube and such repeatability suffers when some samples have bubbles and others do not.

In consideration of the comments received, the Committee agreed to maintain the item's Developing status.

Regional Association Comments:
At its spring 2016 Annual Meeting, the CWMA recommended this item be withdrawn based on a suggestion from the item's submitter that the item would be more appropriately included in NIST Handbook 133.

NEWMA reported that it did not receive any comments on this item at its spring 2016 Annual Meeting and agreed forward it to the NCWM as a Developing item.

At its fall 2015 Annual Meeting, the SWMA heard comments in support of this item and forwarded it to NCWM, recommending it as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

331 VEHICLE-TANK METERS

331-1 V S.1.1.5. Return to Zero, S.1.1.6. Initial Zero Indication – Electronic Devices (See Related Items 330-1 and 332-1)

(This item was Adopted.)

Source:
Maryland (2016)

Purpose:
Ensure that a VTM register starts on zero upon initial authorization by following the manufacturer's instructions.

Item Under Consideration:
Amend NIST Handbook 44, Vehicle Tank Meter Code as follows:

S.1.1.5. Return to Zero. – Primary indicating elements shall be readily returnable to a definite zero indication. Means shall be provided to prevent the return of primary indicating elements, and of primary recording elements if these are returnable to zero, beyond their correct zero position. **Primary indicating elements shall not be resettable to zero during a delivery.**

(Amended 2016)

Background/Discussion:
The language that is currently in the NIST Handbook 44, VTM, LPG and NH_3 codes allows for the operator to reset a register to zero if it advances beyond zero when initially activated. This would mean that it is the responsibility of the operator to ensure the device is reset to zero prior to every operation and could easily lead to facilitation of fraud. Technology is currently available that would eliminate this issue, as evidenced by similar language in the LMD Code, Mass Flow Meters Code and the Hydrogen Gas-Measuring Devices Tentative Code. Having the capability to always start on zero would also eliminate the need to print additional receipts in order to reset the device to zero.

Commercial measuring devices such as retail motor-fuel dispensers, vehicle-tank meters, and LPG liquid-measuring systems are required to be "wet-hose type" devices. This means that the system's discharge hose is intended to be full of liquid at all times during its operation. This, coupled with requirements that prevent the drainage of the discharge hose (anti-drain requirements), help ensure that the hose is not drained between deliveries and that the current customer is not paying for the amount of product required to fill the discharge hose.

Between deliveries, the pressure in a discharge hose can sometimes vary with changing conditions. For example, when temperatures increase, the product in the hose may expand; conversely, when temperatures decrease the product may contract. As a result of these often slight changes, when a system is initially activated in preparation for delivery, the discharge hose may go through an initial "pressurization" process in which the discharge hose is filled with liquid. The re-pressurization can sometimes result in an advancement of the indications prior to the delivery of any product, an event often referred to as "computer jump." In this situation, the customer has received no product, but the quantity and total sale indications may indicate that product has been delivered.

Current language in several of the NIST Handbook 44 measuring codes includes requirements for the device user/operator to return indicating and recording elements to zero immediately before a delivery begins. This helps to ensure that deliveries start with a zero indication. This also requires that, if the system advances or "computer jump" occurs during the initial activation of the system, the operator reset the indications to zero.

Initially, most of the measuring codes did not include any specifications requiring that a system be designed with provisions to help ensure a zero start without necessitating intervention by the operator. While the user requirements referenced above can help, experience is showing that a user requirement by itself is not always effective in ensuring that transactions consistently start on zero. In 2005, the NCWM recognized that, with increased unit prices, the computer jump that sometimes occurs with retail motor-fuel dispensers was resulting in the advancement of the total sale indications prior to the delivery of any fuel.

Systems that routinely experience computer jump facilitate transactions that do not start on zero prior to the delivery of product and, thus, facilitate fraud. If a driver has already inserted a ticket in a VTM or LPG VTM, it is questionable (and probably unlikely) that the operator will reset the indications to zero after the hose has pressurized (and the indications have advanced) and put another ticket into the device. A better solution would be the addition of a requirement similar to that in LMD Code paragraph S.1.6.1. Indication of Delivery which includes the following nonretroactive provision to include automatic means to help ensure the transaction starts on zero:

> *For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.*
> *[Nonretroactive as of January 1, 2006]*

Although most systems include a provision to prevent the reset operation from occurring during a delivery, this is not specified in all codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG & NH_3 codes.

Note that consideration may also need to be given to limiting the quantity that can be suppressed as is currently referenced in LMD Code paragraph S.1.6.1.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Items 330-1, 331-1, and 332-1 and comments were taken simultaneously since the Committee considered them companion items. See Item 330-1 for a summary of comments received and the specific actions taken by the Committee for each of these items.

The Committee agreed to amend each of the three items based on the comments received during its open hearings. The Committee also agreed to present each item for vote at the Annual Meeting. The changes agreed to by the Committee are reflected in the Item Under Consideration.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting open hearings, the Committee announced it was grouping Agenda Items 330-1, 331-1, and 332-1 together and taking comments on all simultaneously. See Agenda Item 330-1 for a summary of the comments heard and that actions taken by the Committee on these items.

Hearing no comments in opposition the Committee agreed to present Items 330-1, 331-1, and 332-1 for Vote; each without change as shown in Item Under Consideration.

Regional Association Comments:
At its spring 2016 Annual Meeting, the CWMA reported no comments were received on this item. The CWMA feels this item is fully developed and recommends it be a Voting item on the NCWM Agenda.

At its spring 2016 Annual Meeting, NEWMA received comments that the item would harmonize the LMD, VTM, and LPG/NH_3 codes with other measuring codes. NEWMA feels this item has been properly developed and will recommend it be a Voting item.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 330-1, 331-1 and 332-1, and all items were heard together. The SWMA believes the items have merit and forwarded the items to NCWM, recommending that they be Voting items.

331-2 V Table S.2.2. Categories of Sealing and Methods of Sealing (See Related Items 332-4, 334-1, 335-1, 337-1, 338-1 and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook, 44 Vehicle-Tank Meters Code as follows:

Table S.2.2.
Categories of Device and Methods of Sealing

Categories of Device	*Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]
(Table Added 2006) **(Amended 2016)**

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the

2015 NCWM Annual Meeting when language was added to recognize the additional use of an electronic format. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. Ms. Tina Butcher (OWM) commented that the changes proposed to the sealing requirements in each of these codes would harmonize the language to that which was adopted last year in the LMD Code. She also suggested consideration be given to making similar changes to the audit trail criteria for Category 3 devices in other NIST Handbook 44 codes.

Mr. Dmitri Karimov (Liquid Controls, LLC) supported assigning a Voting status to the item.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and consequently agreed to recommend each item for vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. Industry and regulatory officials, alike, voiced support for these items. It was stated that the proposed changes to the sealing requirements would harmonize the language to that which was adopted in 2015 for the LMD Codes, thereby, providing consistency across all measuring device codes in NIST Handbook 44. Hearing no comments in opposition, the Committee agreed to present these items for vote.

Regional Association Comments:
The CWMA reported, at its spring 2016 Annual Meeting, that it feels this item is fully developed and recommended it be a Voting item on the NCWM Agenda.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these items: 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

331-3 D S.3.7. Manifold Hose Flush System

Source:
New York (2016)

Purpose:
Recognize the use of hose flush systems in the NIST Handbook 44, Vehicle-Tank Meters (VTM) code**.**

Item under Consideration:
Amend NIST Handbook 44, Vehicle-Tank Meter Code as follows:

S.3.7. Manifold Hose Flush System. – A hose flush system to clear the hose of product may be installed in the manifold when multiple products are dispensed through a single meter and hose under the following conditions:

(a) the inlet valves for the system are conspicuously located above the bottom framework of the truck;

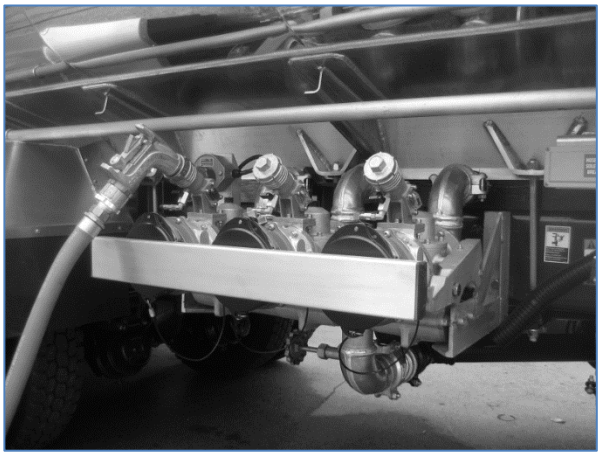
(b) the inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use;

(c) the discharge hose remains of the wet hose type;

(d) the direction of flow for which the system may be set at any time is definitely and conspicuously indicated; and

(e) a recorded representation of each flush is maintained for inspection.

Background/Discussion:
Hose flush systems allow drivers to flush product where a truck is set-up to deliver multiple products through a single meter and hose. The system is particularly popular because it allows drivers to flush product without having to climb up on top of the truck, which is a common practice in the industry but can also be dangerous. These systems are considered a significant safety advancement; however, without safeguards in place it could also be used to facilitate fraud. These systems make returning product after weights and measures testing very easy. These systems are also very good for preventing contamination of product. Photographs of one such system are shown below.



Three-Compartment Manifold with Nozzle

Three-Compartment Manifold

These systems are being used country-wide and there is no uniformity in what is and what is not acceptable by weights and measures. Some states have developed their own policies for acceptance but this has led to problems when trucks have been moved from one state to another. Some states are considering prohibiting these systems citing facilitation of fraud; however, they are also concerned that such prohibition may lead to drivers being unnecessarily injured or even killed. Regulators want to do their jobs, but also want drivers to be able to do their jobs in the safest way possible.

2016 NCWM Interim Meeting:
The Committee heard comments on this item from Mr. Mike Sikula (New York), Mr. Hal Prince (Florida), Mr. Steve Giguere (Maine), Mr. John McGuire (New Jersey), Mr. Charlie Carroll (Massachusetts), Ms. Tina Butcher (OWM), Mr. Dmitri Karimov (Liquid Controls), and Mr. Dick Suiter (Richard Suiter Consulting). Mr. Sikula indicated that some newer trucks were designed with manifold hose flush systems that needed controls to prevent fraud, and he also pointed out that this was a nationwide issue not just a New York issue.

Ms. Butcher mentioned a need to provide additional safeguards; mark direction of flow on inlet and outlet valves; and add user requirements on when and how these systems should be used. Mr. Karimov advocated the addition of a second meter. Mr. Carroll said manifold flush systems should not be allowed.

There was general consensus in the comments heard that the hose flush back systems have arisen from a desire to minimize safety concerns with the delivery drivers having to climb up on top of trucks to flush hoses; however, these systems could enable fraud as fuel could be diverted after the meter and documentation of the flushing is typically not maintained. The Committee believes this item has merit and needs further development and is interested in hearing from other states and manufacturers on this issue.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee received an update on this item from its submitter, Mr. Mike Sikula (New York). Mr. Sikula reported that manifold hose flush systems continue to be an issue in New York and that work on this item is ongoing.

Ms. Tina Butcher (NIST, OWM) reiterated a number of the comments and recommendations which OWM had presented at the 2016 NCWM Interim Meeting and had shared with the submitter. The following is a shortened summary of the comments and recommendations she provided:

- There are undoubtedly safety and time advantages to being able to flush product from a hose using this system; there are also obvious concerns about the possibility of facilitation of fraud.

- It is presumably very easy to pump metered product back into the tank with this system and it is much less obvious and less difficult than climbing to the top of the truck with a charged hose and returning it through the hatches. Particularly in an environment where customers are often not present during the delivery, this creates serious concerns about its potential misuse and the ease with which that misuse can occur.

- If manifold hose flush systems are permitted, it is essential to have certain safeguards in place to help prevent misuse; yet still allow the operator to benefit from improved safety and ease of use offered by these systems.

- The system does not appear to violate the diversion of product requirements outlined in VTM Code paragraph S.3.1. Diversion of Measured Liquid since the manifold equipment isn't part of the discharge line or piping connected to the metering systems.

- The process of diverting already measured product through the use of the system would not be obvious to an untrained observer and is much more easily accomplished than having to climb to the top of a truck and flushing product back into one of the storage compartments.

The following key points and questions were also provided by OWM in written comments and recommendations to the Committee for it to consider in its assessment of this proposal:

- An argument in favor of such a system is that it provides a safer alternative for the operator to use than climbing to the top of the truck when flushing product back into the storage tank. Additionally, it may encourage proper flushing and help reduce operators taking shortcuts; this could prevent product contamination in a customer's tank and the potential safety hazards associated with such contamination. However, safeguards in the form of automatic features as well as user requirements would be essential to discourage misuse.

- The inlet valves for the system need to be clearly and permanently marked to indicate they are for use in "flushing" so that their purpose is clear to an observer.

- The meter and printer are presumably in operation during this procedure, which also means that, if the system were misused, the operation could take place at the beginning or end of a customer's delivery, thus diverting measured product. NIST, OWM previously read information on such a system that indicated there are safeguards to help prevent cross contamination of product. This suggests some degree of sophistication in the software, suggesting that it may be possible to incorporate other safeguards to help prevent misuse of the system. Consequently, OWM believes that displayed and recorded indications of quantity should be automatically inhibited whenever the flush system is in operation. Alternatively, or perhaps in addition, a requirement should be included to require clear indications that the indicated and recorded quantity and other associated information are not to be used for commercial purposes.

- An added measure of protection would be provided if, while in the "flush" mode, there is a clear indication that the device is not in normal operation.

- An accompanying user requirement clarifying that the flush system is not to be used during a commercial transaction would also help limit its use. The operator should have to reset the system following the flush procedure prior to beginning a commercial transaction. Is additional language needed to clarify this?

- OWM believes an associated user requirement needs to be included to restrict the use of such systems and to help ensure their proper use. A suggestion is provided at the end of OWM's comments on this item, but further refinement and input are needed.

- Is using the same meter to dispense products that are significantly different enough to create the need to routinely recirculate product, a suitable use of the equipment? Using different meters to avoid the contamination and safety issue altogether would eliminate the need for such a system. What is the cost of a second meter relative to the cost (and fraud risk) of this manifold system? Some have reported that the number of companies running different products (e.g., gas and home heating oil) through the same meter has diminished because of safety concerns, but we still hear about such scenarios when we conduct training schools.

- Are these systems installed on metering systems that are *not* equipped with the capability to measure different products with different accuracy settings (e.g., product codes with associated calibration factors)? If a meter (such as a mechanical meter with mechanical indicator) without such features is used for multiple different products, presumably there are no provisions to allow for different accuracy settings. A flush system might encourage this type of scenario and consideration might need to be given to limiting the system to only systems with multiple product/calibration factor capability.

- How will the owner/operator track metered product for use in tax reporting? Will the indications be suppressed to ensure that it is not recorded as delivered product? Or is a printed or electronic record provided of recirculated product or perhaps the totalizer readings could be used?

- Is there any control or interlock that would prevent flushing the hose into the manifold for the ***same*** product selected for delivery? For example, if the operator last delivered gasoline and has selected fuel oil for the current transaction, should the system prevent the operator from flushing the hose back into the same product type (for which there is presumably no need to flush the hose)? This might provide an added safeguard that would prevent someone from "recirculating" the same product rather than "flushing" a different type of product. At minimum, this should be a user requirement; it would be best if it could also be required in the flush system design.

- The visible view ports provide the operator with a means to visually observe when the product has flushed from the hose. Will this be a feature on all such systems? Is there any reason to require such viewing ports?

- In LMD Code paragraph S.3.1. Diversion of Measured Liquid, a provision was added to allow purging or draining, but only when the system is not in operation. In reviewing the history for the LMD Code paragraph, it appears that such provisions were not added to that paragraph in the VTM Code, but not necessarily because of greater concerns over fraud in the VTM applications. Instead, it was likely that the question just hadn't come up for those applications. The provision in the LMD Code provides an example in which weights and measures officials have allowed a feature or operation that is deemed necessary to normal operation (just as one could argue line purging to prevent cross contamination is necessary), but which could otherwise facilitate fraud. In other words, if the concern over fraud is great enough, then additional provisions may need to be added to the code or required via interpretation of G-S.2. to minimize the possibility through the use of a "necessary" feature before that feature is allowed. Thus, the addition of the proposed paragraph to the VTM Code would acknowledge the use of the feature, but provide additional safeguards for its proper use.

- An additional aspect of the LMD Code paragraph S.3.1. Diversion of Measured Liquid is that it includes requirements prohibiting diversion of measured product from the measuring chamber or its discharge line. However, outlets for purging or draining the system are permitted under limited, specific circumstances. In recognition of the importance of ensuring that product is not recirculated during a commercial transaction, a

provision was included in the LMD Code requirement that inhibits meter indications during the process of recirculating:

> Effective automatic means shall be provided to prevent passage of liquid through any such outlet during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the outlet is in operation.

OWM suggests that similar language be included in the proposed paragraph such that the indications and any recorded representations are inhibited during the recirculation process. Alternatively, but less desirable, would be that the displayed and printed quantity indications be unusable or clearly designated as such.

- The statement "inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use" might be better included as a user requirement.

- Should the requirement include provisions for a programmable limit on the quantity of fuel that can be flushed based on the volume of the hose for an individual metering system?

- The CWMA, SWMA, and WWMA have not yet reviewed this item; it will be beneficial to hear input from officials and industry in those regions to ensure that key technical issues and concerns have been addressed.

Based on these observations and comments, OWM recommends the following alternative version of the original proposal:

S.3.7. Manifold Hose Flush System. – A hose flush system that may be used for purging the measuring system. Such a system shall only be installed in the manifold when multiple products are dispensed through a single meter and hose, provided all of the following conditions are met:

(a) The discharge hose remains of the wet hose type.

(b) The inlet valves for the system are conspicuously located above the bottom framework of the truck.

(c) The inlet valves for the system must be clearly marked to indicate they are used for "flushing" product.

(d) The flush system is not to be operational during a commercial transaction.

~~**(e) The inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use.**~~

(e) The direction of product flow is clearly and automatically indicated during operation of the measuring and/or the flush systems.

(f) Effective automatic means shall be provided to prevent passage of liquid through any such flush system during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the flush system is in operation.

(g) A clear indication is provided, both in the quantity indications and any associated recorded representations, stating that the device is in a "flushing mode" and "not for commercial use" when the flush system is in operation.

(h) A recorded representation of each flush is maintained for inspection.

Additionally, NIST, OWM recommends the inclusion of a proposed new "User Requirement" to help ensure proper application and use of such flush systems. The following is offered for consideration:

UR.2.6. Manifold Hose Flush System Use. – A manifold flush system or similar system designed to assist in flushing product between deliveries is not to be used or operational during a commercial transaction. The inlet valves for the system are not to be connected to any hose or piping (dust covers are permitted) when not in use. When the flushing system is in operation, the discharge hose is only to be connected to the port for the product type being flushed from the discharge line. Following the flushing process, indications and recording elements must be reset to zero prior to beginning a commercial delivery. A manifold flush system is not to be used on a metering system that is not equipped with the capability to accept separate calibration factors for different product types.

(Added 20XX)

In consideration of the comments received, the Committee agreed to maintain the Developing status of the item to allow additional time for its further development.

Regional Association Comments:
At its spring 2016 Annual Meeting, the CWMA reported it feels this item has merit and the comments received were in support of it but it is in need of development. Consequently, the CWMA recommended it be a Developing item on the NCWM Agenda.

At its fall 2015 Interim Meeting, NEWMA commented that it may not be an overt bad practice of illegal bypass, but it is a good start for providing safety. NEWMA believes the item has merit and forwarded it to NCWM, recommending that it be a Developing item. At its spring 2016 Annual Meeting, the submitter requested to make this an Information item but NEWMA feels there is still work to be done by the submitter and recommended the item remain Developing.

331-4 V N.4.6. Verification of Linearization Factors.

(This item was Adopted.)

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To update NIST Handbook 44 to reflect the technological changes in registers for vehicle-tank meters and to alert weights and measures officials to the fact that error in start-up and shut-down delivery quantities can introduce linear errors in the calibration at normal flow rates which increase the further the delivered quantity deviates from the prover size used at calibration.

Item under Consideration:
Amend NIST Handbook 44, Vehicle Tank Meter Code by adding the following:

N.4.6. Verification of Linearization Factors. – All enabled linearization factors shall be verified. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis, at the discretion of the official with statutory authority.

(Added 2016)

UR.3. Maintenance Requirements.

UR.3.1. Use of Adjustments. – Whenever a device is adjusted, all enabled linearization factors shall be verified to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis.

(Added 2016)

Background/Discussion:
Many terminals and refineries want to maximize the accuracy of their liquid-measuring devices by optimizing the calibration factors at typical delivery speeds and some bulk delivery companies are beginning to utilize the capabilities of electronic registers with multiple calibration factors to optimize their accuracy at flow rates that are customarily used. Just like registers on wholesale liquid measuring devices, these meters can be configured for a standard initial "start-up" and ending "shut-down" quantity delivered at a slower speed than is used for the remainder of the delivery. Service agents are expected to calibrate devices as close to zero as possible, but spending time calibrating normal delivery rates to a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. On the other hand, an unscrupulous operator could also use the known error introduced by the start-up and shut-down errors to calibrate the normal delivery rates so that all the errors on typical deliveries work predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shut-down errors have a counter-intuitive effect. Underregistration, which normally operates in the consumers' favor, may actually create shortages in the total delivery if calibration of the normal rate was adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down error are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to calculate the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge.

This proposal has no effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no problems with this requirement by making sure that their devices are in tolerance at the slower start-up and shut-down flow rates and errors are not predominantly in one direction or the other.

See Appendix E, *How Slow Flow Errors Affect VTMs*, and the 2014 and 2015 S&T Committee's Annual Report to review previous language and positions regarding this item.

2016 NCWM Interim Meeting:
Agenda Item 331-4 was amended immediately prior to the 2016 NCWM Interim Meeting as a result of a Multipoint-Calibration Work Group (MPCWG) meeting held on Sunday morning, prior to the start of the Interim Meeting. The new wording eliminates the conditions when a linearization factor would need to be verified because it was agreed that such details are better suited for inclusion in training material, a NIST EPO, or other document used as a resource in understanding the different factors necessitating verification.

The new wording ensures that all factors in a meter are verified each time any meter factor is changed. Verification of a factor may take the form of a physical test at the specified flow-rate or may be an evaluation of the factor using mathematical empirical analysis to ensure that the factor is reasonable for the affected flow rate. In all cases, a physical test must be performed at one or more specified flow rates.

During the open hearings, clarification was requested from the floor on how to apply factors when multiple products are involved. Ms. Julie Quinn (Minnesota), Chairperson of the MPCWG, clarified that the intent is that all factors for all products, including grades of product within a family, are to be verified anytime a change is made. However, this verification may simply be a comparison of factors used between product grades to ensure they remain consistent.

Ms. Tina Butcher (NIST, OWM) asked that OWM be given a chance to further study the new language in the proposal. OWM would also like to see a clarification of the term "empirical analysis" and proposed that the current wording leaves too much open to interpretation. Ms. Quinn agreed with the need to clarify what is meant by "empirical analysis."

Representatives from Liquid Controls and Flint Hill Resources supported the item as presented.

Based on comments received, the Committee agreed to amend the proposal as requested by the MPCWG and to present the item as shown in Item Under Consideration for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting open hearings, the Committee agreed grouped together agenda Items 330-3 and 331-4 and took comments on these two items simultaneously. See Agenda Item 330-3 for a summary of the comments heard and the actions taken by the Committee on these items.

Regional Association Comments:
The WWMA reported at its 2015 fall Annual Meeting that Ms. Tina Butcher, NIST, OWM, submitted minor revisions to the proposal on behalf of the submitter. The WWMA believes that this proposal has been developed enough and recommended that it be an Information item as follows:

N.4.6. Initial Verification. – A vehicle tank meter shall be tested at all flow rates and with all products for which a calibration factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.

A vehicle tank meter not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.

Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm, and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm and 100 gpm.

The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.

UR.1.5. Initial Verification Proving Reports. – Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.

N.4.6. Verification of Linearization Factors. – All enabled linearization factors shall be verified:

- **(a) when a device is initially being put into commercial use;**
- **(b) when a device has been placed into service and is officially being tested for the first time;**
- **(c) when a device is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;**
- **(d) when a device is being officially tested for the first time after major reconditioning or overhaul; or**
- **(e) at the discretion of the official with statutory authority.**

The verification of enabled linearization factors may be done through physical testing or empirical.

UR.3. Maintenance Requirements.

UR.3.1. Use of Adjustments. – Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

At its fall meeting, the CWMA reported that it believes this proposal will help ensure accuracy and allow for efficient testing of these devices. The CWMA recommended that the item be modified as follows and that it be a Voting item:

N.4.5. Verification of Linearization Factors. – All enabled linearization factors shall be verified:

(a) when a device is initially being put into commercial use;

(b) when a device has been placed into service and is officially being tested for the first time;

(c) when a device is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;

(d) when a device is being officially tested for the first time after major reconditioning or overhaul; or

(e) at the discretion of the official with statutory authority.

The verification of enabled linearization factors may be done through physical testing or empirical analysis.

UR.4. Maintenance Requirements.

UR.4.1. Use of Adjustments. – Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

At its spring 2016 Annual Meeting, the CWMA recommended the item be presented as a Voting item on the NCWM agenda noting it feels the item is fully developed.

NEWMA reported at its fall 2015 Interim Meeting that it realizes multi-point calibrations are not going away and need to be addressed; however, this item needs further work by the Committee to address concerns. NEWMA recommended that this item be an Information item. NEWMA heard comments in support of the item at its spring 2016 Annual Meeting and recommended it be a Voting item on the NCWM agenda.

The SWMA batched this item with Item 330-3 and heard them together at its fall 2015 Annual Meeting. It reported that it believes the item needs further development and recommended that it remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

332-1 V S.1.4.2. Return to Zero, S.1.4.3. Initial Zero Indication – Electronic Devices. (See Related Items 3301 and 3311)

(This item was Adopted.)

Source:
Maryland (2016)

Purpose:
Ensure that a register starts on zero upon initial authorization by following the manufacturer's instructions.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

S.1.4.2. Return to Zero.

(a) Primary indicating elements shall be readily returnable to a definite zero indication.

(b) Primary recording elements on a stationary retail device shall be readily returnable to a definite zero indication if the device is equipped to record.

(c) Means shall be provided to prevent the return of primary indicating elements and of primary recording elements if these are returnable to zero, beyond their correct zero position.

(d) Primary indicating elements shall not be resettable to zero during a delivery.

(Amended 1990 **and 2016**)

Background/Discussion:
The language that is currently in the NIST Handbook 44, VTM and LPG and NH_3 codes allows for the operator to reset a register to zero if it advances beyond zero when initially activated. This would mean that it is the responsibility of the operator to ensure the device is reset to zero prior to every operation and could easily lead to facilitation of fraud. Technology is currently available that would eliminate this issue, as evidenced by similar language in the LMD Code, Mass Flow Meters Code, and the Hydrogen Gas-Measuring Devices Tentative Code. Having the capability to always start on zero would also eliminate the need to print additional receipts in order to reset the device to zero.

Commercial measuring devices such as retail motor-fuel dispensers, vehicle-tank meters, and LPG liquid-measuring systems are required to be "wet-hose type" devices. This means that the system's discharge hose is intended to be full of liquid at all times during its operation. This, coupled with requirements that prevent the drainage of the discharge hose (anti-drain requirements), help ensure that the hose is not drained between deliveries and that the current customer is not paying for the amount of product required to fill the discharge hose.

Between deliveries, the pressure in a discharge hose can sometimes vary with changing conditions. For example, when temperatures increase, the product in the hose may expand; conversely, when temperatures decrease the product may contract. As a result of these often slight changes, when a system is initially activated in preparation for delivery, the discharge hose may go through an initial "pressurization" process in which the discharge hose is filled with liquid. The re-pressurization can sometimes result in an advancement of the indications prior to the delivery of any product, an event often referred to as "computer jump." In this situation, the customer has received no product, but the quantity and total sale indications may indicate that product has been delivered.

Current language in several of the NIST Handbook 44 measuring codes includes requirements for the device user/operator to return indicating and recording elements to zero immediately before a delivery begins. This helps to

ensure that deliveries start with a zero indication. This also requires that, if the system advances or "computer jump" occurs during the initial activation of the system that the operator reset the indications to zero.

Initially, most of the measuring codes did not include any specifications requiring that a system be designed with provisions to help ensure a zero start without necessitating intervention by the operator. While the user requirements referenced above can help, experience is showing that a user requirement by itself is not always effective in ensuring that transactions consistently start on zero. In 2005, the NCWM recognized that, with increased unit prices, the computer jump that sometimes occurs with retail motor-fuel dispensers was resulting in the advancement of the total sale indications prior to the delivery of any fuel.

Systems that routinely experience computer jump facilitate transactions that do not start on zero prior to the delivery of product and, thus, facilitate fraud. If a driver has already inserted a ticket in a VTM or LPG VTM, it is questionable (and probably unlikely) that the operator will reset the indications to zero after the hose has pressurized (and the indications have advanced) and put another ticket into the device. A better solution would be the addition of a requirement similar to that in LMD Code paragraph S.1.6.1. Indication of Delivery which includes the following nonretroactive provision to include automatic means to help ensure the transaction starts on zero:

> For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.
> [Nonretroactive as of January 1, 2006]

Although most systems include a provision to prevent the reset operation from occurring during a delivery, this is not specified in all codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG & NH_3 codes.

Note that consideration may also need to be given to limiting the quantity that can be suppressed as is currently referenced in LMD Code paragraph S.1.6.1.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Items 330-1, 331-1, and 332-1 and comments were taken simultaneously since the Committee considered them companion items. See Item 330-1 for a summary of comments received and the specific actions taken by the Committee for each of these items.

The Committee agreed to amend each of the three items based on the comments received during its open hearings. The Committee also agreed to present each item for vote at the Annual Meeting. The changes agreed to by the Committee are reflected in the Item Under Consideration.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting open hearings, the Committee announced it was grouping Agenda Items 330-1, 331-1, and 332-1 together and taking comments on all simultaneously. See Agenda Item 330-1 for a summary of the comments heard and the actions taken by the Committee on these items.

Hearing no comments in opposition the Committee agreed to present Items 330-1, 331-1, and 332-1 for Vote; each without change as shown in Item Under Consideration.

Regional Association Comments:
At its spring 2016 Annual Meeting, the CWMA reported there were no comments received on this item. The CWMA feels this item is fully developed and recommended it be a Voting item on the NCWM Agenda.

At its spring 2016 Annual Meeting, NEWMA received comments indicating that the item would harmonize the LMD, VTM, and LPG/NH3 codes with other measuring codes. NEWMA recommended the item be a Voting item on the NCWM Agenda.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 330-1, 331-1 and 332-1 and all items were heard together. The SWMA believes the items have merit and forwarded the items to NCWM, recommending that they be Voting items.

332-2 V S.1.4.3. Provisions for Power Loss, S.1.5.1.1. Unit Price., S.1.5.1.2. Product Identity., S.1.6. For Retail Motor Vehicle Fuel Devices Only., S.1.7. For Wholesale Devices Only., UR.2.7. Unit Price and Product Identity., and UR.2.8. Computing Device.

(This item was Adopted.)

Source:
California Department of Food and Agriculture Division of Measurement Standards (2014)

Purpose:
Add similar Specifications and User Requirements for other retail motor-fuel devices to NIST Handbook 44 Section 3.32. Liquefied Petroleum Gas (LPG) and Anhydrous Liquid-Measuring Devices Code similar to those in Section 3.30. Liquid-Measuring Devices, Section 3.37. Mass flow Meters, and Section 3.39. Hydrogen-Gas Measuring Devices Tentative Code.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

S.1.4. For Retail Devices Only.

S.1.4.1. Indication of Delivery. – A retail device shall ~~**be constructed to show**~~ automatically **show on** its **face the** initial zero condition and the ~~**amounts**~~ **quantity** delivered up to the nominal capacity of the device. **However, the following requirements shall apply:**

For electronic devices manufactured prior to January 1, 2006, the first 0.03 L (or 0.009 gal) of a delivery and its associated total sales price need not be indicated.

For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.
[Nonretroactive as of January 1, 2006]

(Amended 2016)

S.1.5. For Stationary Retail Devices Only.

S.1.5.1. Display of Unit Price and Product Identity. – ~~In a~~ **A** device of the computing type~~**, means**~~ shall ~~**be provided for**~~ display~~**ing**~~ on each face ~~**of the device**~~ the unit price at which the device is set to compute or to deliver ~~**as the case may be**~~, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. ~~**If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device.**~~

Except for dispensers used exclusively for fleet sales and other price contract sales, all of the unit prices at which that product is offered for sale shall meet the following conditions:

(1) For a system that applies a discount prior to the delivery, all unit prices shall be displayed or shall be capable of being displayed on the dispenser through a deliberate action of the purchaser prior to the delivery of the product. It is not necessary that all of the unit prices be simultaneously displayed prior to the delivery of the product.

(2) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (1) above, provided the system complies with S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.

Note: When a product is offered at more than one unit price, display of the unit price information may be through the deliberate action of the customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.

[Nonretroactive as of January 1, 2017]

(Amended 2016)

~~**S.1.5.3. Recorded Representations, Point-of-Sale Systems. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:**~~

~~**(a) the total volume of the delivery;**~~

~~**(b) the unit price;**~~

~~**(c) the total computed price; and**~~

~~**(d) the product identity by name, symbol, abbreviation, or code number.**~~

~~**(Added 2014)**~~

S.1.5.3. Agreement Between Indications.

(a) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:

S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

(a) the product identity by name, symbol, abbreviation, or code number;

(b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

(c) an itemization of the post-delivery discounts to the unit price; and

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 2016)

S.1.5.6. Transaction Information, Power Loss. – 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 device or other onsite device accessible to the customer.
[Nonretroactive as of January 1, 2017]
(Added 2016)

S.1.5.7. Totalizers for Retail Motor-Fuel Dispensers. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through the metering device.
[Nonretroactive as of January 1, 2017]
(Added 2016)

S.2. Design of Measuring Elements.

…

S.2.5. Zero-Set-Back Interlock for Stationary Retail Motor-Fuel Devices – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, 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) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, 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.

[Nonretroactive as of January 1, 2017]
(Added 2016)

S.2.6. ~~**S.2.5.**~~ **Thermometer Well.** – For test purposes, means shall be provided to determine the temperature of the liquid either:

(a) in the liquid chamber of the meter; or

(b) in the meter inlet or discharge line and immediately adjacent to the meter.

(Amended 1987)

S.2.7.~~**S.2.6.**~~ **Automatic Temperature Compensation.** – A device may be equipped with an adjustable automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F).

S.2.7.1~~**S.2.6.1.**~~ **Provision for Deactivating.** – On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters or gallons adjusted to 15 °C (60 °F), provision shall be made to facilitate the deactivation of the automatic temperature-compensating mechanism so that the meter may indicate, and record if it is equipped to record, in terms of the uncompensated volume.

(Amended 1972)

S.2.7.2.~~S.2.6.2.~~ Provision for Sealing. – 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 may be made to the system.

UR.2. Use Requirements.

…

UR.2.7. For Stationary Retail Computing Type Systems Only, Installed After January 1, 201X.

UR.2.7.1. Unit Price and Product Identity.

(a) The following information shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale:

(1) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and

(2) in the case of a computing type device or money-operated type device, the unit price at which the dispenser is set to compute.

Provided that the dispenser complies with S.1.5.1. Display of Unit Price and Product Identity, it is not necessary that all the unit prices be simultaneously displayed or posted.

(b) The following information shall be conspicuously displayed or posted on each side of a retail dispenser used in direct sale:

(1) the identity of the product in descriptive commercial terms; and

(2) the identity of the grade, brand, blend, or mixture that a multi-product dispenser is set to deliver.

(Added 2016)

UR.2.7.2. 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.

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 unit of measure, the total quantity delivered, and the total price of the sale; and

(2) unless a dispenser complies with S.1.5.1. 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.

(c) A dispenser used in an application where a price per unit discount is offered following the

delivery is exempt from this requirement, provided the following conditions are satisfied:

(1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;

(2) all purchases of fuel are accompanied by a receipt recorded by the system for the transaction containing:

(a) the product identity by name, symbol, abbreviation, or code number;

(b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:

1. total volume of the delivery;

2. unit price; and

3. total computed price of the fuel sale prior to post-delivery discounts being applied.

(c) an itemization of the post-delivery discounts to the unit price; and

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 2016)

Background/Discussion:
The NCWM Publication 14 checklist for Liquefied-Petroleum Gas (LPG) Retail Motor Fuel Devices verifies compliance with specifications, such as: "Power Loss" (which requires a 15-minute power back up) and "Zero-Setback Interlocks." However, these specifications are not located in Section 3.32. of NIST Handbook 44.

There are LPG devices with NTEP Certificates of Conformance (CCs) that meet current "power loss" and "zero-setback interlock" requirements. However, there are other LPG retail motor-fuel devices in the field that consist of an assembly of separable, compatible, and type evaluated LPG measuring and indicating elements, key/card lock systems that do not meet the power loss and interlock requirements because those requirements are not within the LPG Code and were not applied to the components during type evaluation. This creates unfair competition with holders of NTEP CCs for LPG retail dispensers.

There are newer LPG dispensers coming in to use, where measuring, indicating, and computing elements are assembled in retail motor fuel dispenser housings. These LPG devices serve as both propane bottle fillers and as retail motor fuel devices using separate hoses and nozzles on a dispenser. Many of these dispensers, while they do have a good safety history, are not assembled in compliance with safety standards such as UL 495 or 1238, or NFPA 50. Nor are they typically installed in accordance with NFPA 30A or NFPA 70.

Existing retail LPG dispensers can be adapted to fuel LPG-powered motor vehicles by adding a simple adaptor which attaches to the LPG nozzle on the dispenser's hose. There are currently five active and two inactive NTEP Certificates of Conformance for LPG retail motor-fuel dispensers listed in the NCWM Database.

See the 2014 and 2015 S&T Committee's Annual Report for additional background information and to review previous language and positions to amend the NIST Handbook 44 Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Ms. Tina Butcher (NIST, OWM) reiterated the same concern that OWM had expressed at the 2015 NCWM Annual Meeting that the Item Under Consideration was *not* the latest version of the proposal and that the latest version needed to replace it. It was noted that the latest version of the proposal had been posted on NCWM's website. An official from the State of California and another from

Alameda County, California, commented that they support the latest version of the proposal referenced by Ms. Butcher. Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, reported that the MMA also supports the latest version of the proposal.

Based on the comments received during the open hearings, the Committee agreed to replace the proposal appearing in the Item Under Consideration in 2016 NCWM Publication 15 with the latest version as shown in the Item Under Consideration in this report and present it for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee heard comments in support of the proposal from Ms. Tina Butcher (NIST, OWM). Ms. Butcher reported that the revised proposal had been submitted by NIST and the MAA with additional input having also been received from the 2015 WWMA Annual Meeting. Ms. Butcher stated that OWM believes the proposed amendments will help ensure that much-needed changes are made to the LPG and NH_3 Code to align it with the LMD Code. Mr. Dimitri Karimov (Liquid Controls), speaking on behalf of the MMA, also supported the proposal.

A regulatory official questioned the meaning of the word "face" in proposed sub-paragraph UR.2.7.1.(a) and Ms. Butcher indicated that a clear definition for the word is included in NIST Handbook 44, Appendix D. However, that definition is currently intended only to apply to LMDs as indicated by the reference to Section 3.30. within the brackets shown immediately following the definition. Ms. Butcher then suggested someone might consider drafting a new proposal to add an additional reference to Section 3.32. to the bracketed area of the definition since, in her opinion, the definition could be applied to both device types.

The Committee, hearing no comments in opposition and only comments in support of the changes, agreed to present the item for Vote.

Regional Association Comments:
The WWMA, at its fall 2015 Annual Meeting, reported that the MMA and OWM submitted a proposal to replace the "Item under Consideration" in the S&T Committee's 2015 Interim and Annual Report with this proposal. At their September 2015 Annual Meeting, the NTEP Measuring Sector reviewed this proposal and indicated its support of this version. The WWMA believes that the revised version of this proposal is fully developed and recommended that it be a Voting item. [Technical Advisor's Note: This version appears in the "Item Under Consideration" in this report.]

The CWMA reported it believes this item will add consistency across similar devices types and recommended it be a Voting item at both its 2015 Interim and 2016 Annual Meetings.

NEWMA recommended, at both its fall 2015 Interim Meeting and spring 2016 Annual Meeting, the item be forwarded to the NCWM as a Voting item as it is complete and would harmonize the LMD, VTM, and LPG/NH_3 codes with other measuring codes.

The SWMA reported, at its fall 2015 meeting, that it believes the revised proposal by NIST is fully developed and recommended it be a Voting item on the NCWM agenda.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

332-3 V S.2.1. Vapor Elimination

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:

1) To require that the vapor eliminator on LPG and Anhydrous Ammonia liquid-measuring devices be automatic in operation;

2) To edit the vapor eliminator requirements to ensure clarity and consistency with other measuring codes; and

3) To require that vapor elimination vent lines be made of a non-collapsible material.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

S.2.1. Vapor Elimination.

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 2016)

Background/Discussion:
The proposed changes to S.2.1. would clarify that the LPG or Anhydrous Ammonia liquid-measuring device's vapor eliminator must be automatic in operation and prevent both air and vapor from passing through the meter. Effective operation should not depend on operator intervention or action. Additionally, the proposed changes would require that the vent lines be made of material that resists the potential obstruction (e.g., bending or kinking) that may otherwise prevent the free-flow of air and vapor out of the metering system. Non-rigid vent lines would facilitate fraud and may lead to improper operation of the air/vapor elimination system. These modifications would more closely align the requirement with corresponding requirements in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes.

2016 NCWM Interim Meeting:
At its 2016 NCWM Interim Meeting open hearings, the Committee grouped Items 332-3 and 338-2 together and took comments simultaneously on these items. The Committee received numerous comments in support of these two proposals from enforcement officials and industry representatives alike, but with some suggested changes to the language in each. Dr. Matthew Curran (Florida) noted that the SWMA had suggested amending the two proposals at its 2015 fall Annual Meeting and he also indicated that he was interested in knowing other's opinions concerning those changes. Mr. Richard Suiter (Richard Suiter Consulting) stated that air will never get introduced into an LPG system and suggested the word "air" be removed from the proposed language. Ms. Tina Butcher (NIST, OWM) reported that OWM had submitted this item (and its companion, Item 338-2) to align requirements for vapor elimination with those requirements currently in other measuring device codes. The proposed language requires vapor elimination equipment to be automatic in operation and for vent lines to be constructed of rigid materials.

Ms. Butcher indicated that she agreed with Mr. Suiter's comment regarding "air." She noted that OWM also concurs with the suggestions of the SWMA and that OWM had initially recommended an alternative proposal provided by the SWMA as follows to replace the Item Under Consideration:

S.2.1. Vapor Elimination.

(a) A device shall be equipped with an effective **automatic** ~~**vapor or air eliminator or other effective automatic**~~ means to prevent the passage of vapor ~~**and air**~~ through the meter.

(b) Vent lines from the vapor ~~or air~~ eliminator shall be made of rigid corrosion-resistant ~~metal~~ tubing ~~or other rigid material~~.

This alternative language would address both the CWMA's and Mr. Suiter's comments regarding the use of the term "air." Ms. Butcher further indicated that members of the MMA had reviewed the alternative proposal during their meeting the previous Sunday morning, and recommended replacing part (b) of the proposal with the following:

Vent lines from the vapor eliminator shall be made of metal tubing or other non-collapsible material.

This recommendation by the MMA was based on its members reporting that flexible stainless steel braided hose is an acceptable material to use for a vent line with these devices. Manufacturers of vehicle-mounted equipment, including Mr. Dmitri Karimov (Liquid Controls), pointed out that there is a move away from rigid materials such as metal tubing on vent lines because the vibration from the trucks in which these meters are commonly mounted tends to crack rigid lines. OWM supported the change being recommended by the MMA to the SWMA alternative proposal. A final OWM suggestion was that corresponding requirements in other measuring codes be similarly amended.

One enforcement official indicated that he would have a safety concern using corrugated stainless steel with LPG.

Based on the comments received during the open hearings, the Committee agreed to amend the proposal as shown in Item Under Consideration and present it for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped together Items 332-3 and 338-2 and comments were taken simultaneously since the Committee considered them companion items. All comments received were in support of the items.

Ms. Tina Butcher (NIST, OWM) stated that OWM concurs with the modifications made to the original proposal by the Committee at the 2016 Interim Meeting. OWM believes that the new language will ensure the means provided for vapor elimination are automatic in operation; eliminates the reference to "air" and better addresses the need for the vent line to be constructed of material that prevents it from being intentionally or inadvertently compressed and/or closed off. Ms. Butcher indicated that OWM also suggests similar changes be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such items on its agenda in the 2016 - 2017 NCWM cycle in order to harmonize wording across all affected codes.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, reported that the MMA supports these items as written. Mr. Kurt Floren (Los Angeles County Agric. Comm/Weights and Measures) also voiced his support for the items, but recommended the "Purpose" section of the Committee's Final Report be changed for both items to reflect the change made to the proposals allowing vapor elimination vent lines be made from any non-collapsible material.

In consideration of the comments heard in support of the item, the Committee agreed to present the item for Vote.

Regional Committee Meetings:
The WWMA heard testimony at its 2015 Annual Meeting from Ms. Tina Butcher (NIST, OWM) that this proposal contains clean-up language to align this section with other codes in NIST Handbook 44. The WWMA S&T Committee agreed and during its Committee discussions noted that the requirement that the vent lines be constructed of rigid materials is important. The WWMA believes this item is fully developed and forwarded it to NCWM, recommending that it be a Voting item.

The CWMA, at its fall 2015 Interim Meeting supported the item and recommended it move forward as a Voting item, but also requested that the terminology be reviewed for technical reasons; specifically, the inclusion of the term "air." At its spring 2016 Annual Meeting, the CWMA reported that it feels the item is fully developed and recommended it be forward to the NCWM as a Voting item.

At its fall 2015 Interim Meeting, NEWMA reported it believes the original language is appropriate since air should not be present in a pressurized system. NEWMA did not forward this item to NCWM at that time and recommended that it be withdrawn. However, at its spring 2016 Annual Meeting, NEWMA reported there were no comments received on the item and recommended it move forward as a Voting item.

The SWMA batched this item with Item 338-2 at its 2015 Annual Meeting and heard them together. The Committee recommends this new language based on comments received. The SWMA forwarded the items to NCWM and recommended that they be Voting items.

332-4 V Table S.2.2. Categories of Sealing and Methods of Sealing (See Related Items 331-2, 334-1, 335-1, 337-1, 338-1 and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Devices Code as follows:

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 2016)**

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for Vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See Agenda

Item 331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these items: 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1 and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code. The SWMA forwarded these items to NCWM and recommended to the NCWM that they be Voting items.

332-5 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices as follows:

N.3. Test Drafts.

N.3.1. Minimum Test. – Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.

Background/Discussion:
The use of transfer standards is recognized in code Sections 3.34. Cryogenic Liquid-Measuring Devices Code and 3.38. Carbon Dioxide Liquid-Measuring Devices Code and 3.39. Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues and is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in NIST Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a master meter to test propane delivery truck meters. The State of Nebraska has used a mass flow meter to test agricultural chemical meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice. However, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Mass Flow Meters Code paragraph UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The S&T Committee might also consider amending Sections 3.30. Liquid-Measuring Devices Code and 3.31. Vehicle-Tank Meters Code to allow transfer standard meters.

See the 2015 S&T Committee's Annual Report for additional background information and to review previous language and positions on this proposal.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items.

Mr. Michael Keilty (Endress + Hauser Flowtec), the submitter, stated that he supported this item as a Voting item. Mr. Alan Walker (Florida) spoke in support of the item and recommended it move forward as a Voting item. Mr. Dmitri Karimov (Liquid Controls) recommended limiting the application of the proposal to retail CNG testing, which was echoed by Mr. Randy Moses (Wayne) stating he supported the concept for CNG testing. Mr. Mike Sikula (New York) supported the continued investigation of this item. Ms. Tina Butcher (NIST, OWM) stated that there is a USNWG subgroup presently working to establish uncertainties for select test methods. Currently, there are no representatives on the subcommittee to review factors that affect the uncertainties of measurements using master meters. OWM questions whether or not consideration needs to be given to providing a larger tolerance when conducting tests using a transfer standard as is done in the carbon dioxide and hydrogen codes. Testing would need to be conducted to demonstrate the magnitude of the additional tolerance. Ms. Butcher further stated that if the current proposal passed it doesn't mean that all jurisdictions would support it.

The Committee also received written comments from Mr. Henry Oppermann (Weights and Measures Consulting, LLC) on behalf of Seraphin Test Measure Company suggesting that additional test data is needed to be able to properly evaluate whether or not a calibrated transfer standard (e.g., a master meter) can be considered a suitable standard in testing devices that dispense such products.

During the Committee's work session, members of the Committee acknowledged that both written and some verbal comments received suggested the need for additional test data. It was also acknowledged that there was a lot of support for the proposal. Those supporting the proposal had indicated that using a transfer standard is much easier and faster than testing gravimetrically and eliminates the need to discharge product from a prover into the atmosphere, which is viewed by many as a safety concern. In discussing the item, it was noted that adding a requirement recognizing the use of transfer standards to the two codes wouldn't dictate the method of testing that a jurisdiction would have to use. The proposal only recognizes the use of transfer standards in testing and the decision on whether or not to use a particular method of testing would remain with each jurisdiction. Given these considerations, the Committee agreed to present both items for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. The Committee received numerous comments from industry and regulators alike, predominantly in support of the proposals. The following is a list of many of the more significant comments that the Committee heard in support of the proposals:

- Using a transfer standard (e.g., a calibrated master meter) provides a much safer means of testing than testing gravimetrically because the product discharged during testing goes into a receiving tank and does not get discharged into the atmosphere.

- Using a transfer standard to test provides a faster and more efficient means of testing.

- Adding language to NIST Handbook 44, which recognizes the use of transfer standards in testing, provides the legal basis for using them.

- We have been using transfer standards very successfully in our state and have had no issues.

- NIST Handbook 44 Fundamental Considerations does not address the test method. Only the standard has to be accurate to within one-third of the tolerance to be applied to the device being tested. *(Technical Advisor's **Note:** This comment is in reference to the information contained in NIST Handbook 44, Appendix A. Fundamental Considerations paragraph 3.2. Tolerances for Standards)*

- We support the continued effort of developing alternative test standards for use in testing.

Mr. Marc Buttler (Emerson Process Management – Micro Motion) commented that he supports the adoption of both agenda items with one slight modification; replace the words "maximum discharge rate" with "maximum test rate" in proposed paragraph N.3.2. Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) commented that he fully supports the change suggested by Mr. Buttler.

There were also some comments received suggesting the need for further development of the proposals. Ms. Tina Butcher (NIST, OWM) stated that OWM considers the development of alternative methods of testing commercial measuring systems an important issue because there are many applications in which using currently recognized test methods may not be feasible because of product characteristics, safety, cost, access to equipment, and other factors. Ms. Butcher reiterated many of the comments offered by OWM in previous NCWM Meetings as follows:

- Modifying NIST Handbook 44 as proposed does not ensure approval of any proposed test method. The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.

  There is a need for those selecting an appropriate field standard (i.e., one that is suitable and can provide traceable measurements) to consider the various "essential elements of traceability" such as:

  - the standard's demonstrated reliability over time and its repeatability;
  - how well the standard duplicates actual use;
  - the existence of documentary standards;
  - the availability of equipment and facilities within a state laboratory to test the standard; and
  - whether training has been provided for the laboratory staff, field officials, and users of the equipment.

- It is important for field standards to meet the accuracy requirements specified in the Fundamental Considerations of NIST Handbook 44, Section 3.2. Tolerances for Standards. Those requirements specify that when a standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable tolerance.

- Whether or not consideration needs to be given to providing a larger tolerance when conducting tests using a transfer standard as is done in the carbon dioxide and hydrogen codes. If so, testing would need to be conducted to demonstrate the magnitude of the additional tolerance.

- Because there is a potential for more than one type of alternative test method, the proposed language may unintentionally limit those methods from consideration. For example, the proposed language may not allow the use of a small volume prover. OWM believes more analysis is needed prior to recommending specific language for adoption.

Ms. Butcher noted that weights and measures officials and industry need a system that results in:

- manufacturers knowing the requirements for the design of the standard;
- systematic and appropriate collection of measurement data on proposed new standards; and
- states (regulatory authority) having access to the measurement data to determine whether or not a standard meets the guidelines in NIST Handbook 44, Fundamental Considerations and side-by-side testing to compare results with existing test methods.

Ms. Butcher provided an update on the ongoing work of the U.S. National Working Group on Alternative Test Methods (ATMs) and reported that the NTEP Measuring Sector is currently developing guidelines for use by type-evaluation laboratories when conducting evaluations using transfer standards such as master meters, small volume provers, etc. Information from this group may be useful in further developing this item.

Ms. Butcher also offered the following new OWM comments and recommendations regarding, in particular, the proposal to add paragraph N.3.1. to NIST Handbook 44, Section 3.37. Mass Flow Meters Code:

- Existing paragraph N.3. Test Drafts addresses the minimum test in terms of flow rate. That is, one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate.
    - It is not clear from the proposal if the intent is to strike the existing language in paragraph N.3. The proposal does not show the existing language in the paragraph (except for its title); yet, the language is not shown as being struck.
- Proposed new paragraph N.3.1. addresses the minimum test in terms of delivery amount. That is "at least the amount delivered by the device in one minute at its normal discharge rate."
    - OWM notes that all parts of paragraph N.3.1. Minimum Test shown in Item Under Consideration are new and not just the underlined portion. The entire paragraph should be bold and underlined in the agenda.
- Proposed new paragraph N.3.1. is not consistent with the minimum test of a CNG RMFD being performed today in accordance with the NIST EPO. A test conducted at the MMQ typically takes far less than a minute to complete. Additionally, the test drafts performed at one-third, two-thirds, and three-thirds test tank capacity often are completed in less than a minute's time.
- OWM believes more work is needed to further develop the minimum test requirements in the MFM Code.

In consideration of these points, OWM recommended the two items be changed to Information.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC), speaking on behalf of Seraphin Test Measure, stated that he agreed with OWM's comments and supported them. He disputed the claim made by an earlier speaker that the one-third error specified in NIST Handbook 44, Fundamental Considerations applies only to the test standard. Mr. Oppermann indicated that the one-third tolerance applies not only to the test standard but also the uncertainties created by using the standard. He stressed the need for regulators to be able to prove that their test results are valid and questioned how regulators would know which standards are acceptable if they didn't have the proof to support their accuracy. He further noted that, in some cases, transfer standards are no more accurate than the meter being tested and that the proposals lack a specification associated with the performance of the standard. He recommended the items be downgraded to Information or Developing.

During the Committee's work session, members of the Committee agreed that the comments received during the open hearings were mostly in support of the two proposals. Mr. Harshman (NIST Technical Advisor) requested that members of the Committee, in consideration of the comments OWM had made during the open hearings, review proposed new paragraph N.3.1. in Agenda Item 337-3. Mr. Harshman explained that despite only the title being bold and underlined, the entire paragraph is new. The paragraph defines the minimum test of a mass flow meter and requires each test draft be comprised of at least the amount of product delivered by the device in one minute at its normal discharge rate. Mr. Harshman indicated that this proposed requirement cannot be met by someone wanting to apply the current test procedures in the NIST EPO for retail motor fuel devices used to dispense CNG. The NIST EPO was developed years ago by a work group comprised of subject matter experts, including manufacturers, users, regulatory officials, and others. The procedures in the EPO require a test at one-third, two-thirds, and three-thirds test tank capacity, as well as a test at the minimum measured quantity (MMQ), providing the MMQ is less than one-third test tank capacity. Mr. Harshman noted that it was his experience, in working with some states conducting these tests, that each of these tests typically takes less than a minute to complete and in some cases, far less than a minute. Some Committee members who are familiar with applying the procedures in the NIST EPO agreed that the testing typically takes less than a minute to complete.

The Committee concluded that proposed paragraph N.3.1. would conflict with existing paragraph N.3. Test Drafts, which specifies the minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. This caused the Committee to question whether the submitter had fully considered the impact that the two proposals would have on other existing requirements in the two Codes, which led to the Committee's majority decision to downgrade both items to Developing and return them to the submitter.

Regional Association Comments:
The WWMA S&T Committee did not receive comments on this item during open hearings of its 2015 Annual Meeting**.** During discussion on this item, WWMA S&T Committee members expressed their concern over the choice of requiring two minutes of flow. The WWMA sees possible merit in the proposal but believes that refinements and more test data are needed before further consideration can be given to this item and recommended that this item remain as a Developing item.

At its fall 2015 Interim Meeting, the CWMA reported it believes that the type of meter that could be considered appropriate for use as a transfer standard meter needs to be further defined. At its spring 2016 Annual Meeting, the CWMA reported it feels this item has merit and the comments received were in support of the use of transfer standards once the proper procedures have been developed to insure accuracy, traceability, and suitability. The CWMA recommended the status of the item be Developing at both meetings.

At its fall 2015 Interim Meeting, NEWMA stated that this item should be further developed by the submitter. Master meters are not going away but their accuracy needs to be verified. NEWMA recommended that this item be a Developing item. At its spring 2016 Annual meeting, NEWMA members could not support this item as Voting. There are too many uncertainties associated with the use of a master meter as a transfer standard for select test methods, including issues such as: the calibration of specific viscosities; no clear definition; and no traceability in the use of testing CNG, LNG, and LPG meters. NEWMA recommends the status of this item be changed to Information.

At its fall 2015 Annual Meeting, the SWMA batched this item with Item 337-3 and heard them together. The SWMA recommends that these items be Voting items.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

332-6 I N.4.2.3. For Wholesale Devices

Source:
NIST Office of Weights and Measures (2016)

Purpose:

1) To specify the purpose of special tests conducted on Wholesale LPG and Anhydrous Ammonia Liquid-Measuring Devices;

2) To specify that the special tests are to be conducted at or slightly above the designated flow rates in the referenced paragraph; and

3) To specify that the special tests are not to be conducted below the device's marked minimum discharge rate.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

N.4.2.3. For Wholesale Devices. – ~~**A wholesale device shall be so tested at a minimum discharge rate of:**~~ **"Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. "Special" tests shall include a test at or slightly above the slower of the following rates:**

(a) 40 L (10 gal) per minute for a device with a rated maximum discharge less than 180 L (50 gal) per minute~~.~~**;**

(b) 20 % of the marked maximum discharge rate for a device with a rated maximum discharge of 180 L (50 gal) per minute or more~~,~~**;** or

(c) the minimum discharge rate marked on the device~~, whichever is least~~.

In no case shall the test be performed at a flow rate less than the minimum discharge rate marked on the device.

(Amended 1987 **and 20XX**)

Background/Discussion:
In 2014, the Liquid-Measuring Devices (LMD) Code of NIST Handbook 44 was modified to clarify testing requirements for special tests of wholesale LMDs and to help to ensure that those tests were not conducted at flow rates less than the minimum flow rates marked by the manufacturers of the metering systems. The proposed changes outlined above would align the special test requirements for LPG and Anhydrous Ammonia Liquid-Measuring Devices with those adopted in 2014 in the LMD Code and provide consistency in testing procedures across similar measuring codes.

During training seminars for weights and measures officials and service personnel, NIST, OWM and other trainers instruct students to conduct special tests slightly above the marked minimum flow rate. While an official or service agent is not precluded from setting the flow rate exactly at the marked minimum flow rate, special care must be taken to ensure that the flow rate does not drop below the marked minimum during the course of the test. This can sometimes be difficult in field environments. Flow rates can vary slightly during the course of a test draft due to factors such as changes in system pressure and the number of other devices in use within the system. If the inspector or service agent sets the flow rate exactly at the marked minimum flow rate, such variations can result in the flow rate dropping below the marked minimum flow rate for portions of the test. This could potentially result in an unfair test to the metering system. Additionally, it is sometimes difficult to control the flow rate during the course of the entire test or to even set the flow rate at "exactly" the marked minimum rate. The proposed language would provide flexibility to the inspector or service agent to conduct a special test "at" or "near" the marked minimum and still consider such a test to be valid.

This proposal would provide consistency with 2015 NIST Handbook 44 Section 3.30. Liquid-Measuring Devices Code, Special Tests, paragraph N.4.2.4. Special Tests, Wholesale Devices.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Ms. Tina Butcher (OWM) noted that OWM had submitted this proposal to align requirements in the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code with those adopted in the LMD Code in 2014. The proposed changes would help to avoid testing below the marked minimum flow rate and avoid challenges when running a "slow-flow test" at a rate other than the marked minimum.

Ms. Butcher further noted that the CWMA had suggested additional specificity for the term "slightly above." OWM agrees that this would be beneficial and supports such development. However, the proposed language is the same as that which was adopted by the NCWM in the LMD Code and is only intended to harmonize the two codes. She also noted that, prior to the 2014 adoption of the same term in the LMD Code, the NCWM S&T Committee heard similar comments and acknowledged that the phrase leaves room for interpretation. However, the Committee felt the term is adequate and provides for flexibility, and hearing no other opposition to the proposal, presented the item for a Vote with the phrase "slightly above." Lacking any specific suggestion, rather than delaying this proposal, OWM believes further definition of the term should be proposed as a separate issue that would also encompass the LMD Code.

Ms. Butcher also indicated that OWM proposes modifying the title of this item to include "Special Tests" so that it reads "N.4.2.3. Special Tests, For Wholesale Devices." Paragraph N.4.2.3. is part of a larger paragraph titled "N.4.2. Special Tests."

Mr. Michael Keilty (Endruss + Hauser Flowtec AG USA) commented that he supported the item.

Based on the comments received during the open hearings, the Committee agreed to present this item for Vote at the Annual Meeting.

2016 NCWM Annual Meeting
At the 2016 NCWM Annual Meeting, the Committee agreed to change the status of this item from Voting to Information based on a recommendation from Tina Butcher (NIST, OWM) and the MMA during open hearings. MMA believes the existing text in parts (a), (b), and (c) of paragraph N.4.2.4. For Wholesale Devices is redundant and, for that reason, the MMA prefers downgrading the item to allow additional time to develop the language.

Regional Association Comments:
The WWMA received testimony from Ms. Tina Butcher at its 2015 Annual Meeting, who indicated that the purpose of this proposal is to clarify that the special test should not be conducted exactly at the minimum rated flow rate as the flow rate may drop below the minimum flow rate during the test. The WWMA S&T agreed with her testimony. The WWMA forwarded the item to NCWM and recommended that it be a Voting item.

The CWMA believes that the term "slightly above" should be further defined in relation to part (c) of this proposal. The CWMA forwarded the item to NCWM and recommended that it be a Developing item at its fall 2015 Interim Meeting. At its 2016 Annual Meeting, the CWMA reported it believes the item is fully developed and recommended it be forwarded to the NCWM as a Voting item.

NEWMA stated, at its 2015 Interim Meeting that this item has merit but needs clarification of the language. NEWMA recommended that it be an Information item. At its 2016 Annual Meeting NEWMA reported it agrees the proposal will align requirements of the LPG and NH_3 Code with the LMD code and recommended the item move forward as a Voting item.

The SWMA forwarded this item to NCWM and recommended that it be a Voting item.

332-7 V UR.2.3. Vapor-Return Line

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Clarify conditions under which the use of an LPG vapor return line connected from a supplier's tank to a receiving container is or is not permitted.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

UR.2.3. Vapor-Return Line. – During any metered delivery of liquefied petroleum gas from a supplier's tank to a receiving container, ~~**there shall be no**~~ **a** vapor-return line from the receiving container to the supplier's tank **is prohibited except**:

(a) in the case of any receiving container to which normal deliveries ~~**can**~~ **cannot** be made without the use of such vapor-return line; or

(b) in the case of any ~~**new**~~ **top spray-fill** receiving container when the ambient temperature is ~~**below**~~ **at or above** 90 °F **(32 °C)**.

(Amended 2016)

Background/Discussion:
The current language in NIST Handbook 44 paragraph UR.2.3. Vapor-Return Line continues to cause confusion and generates questions from inspectors, manufacturers, and measuring system users. The intent of the proposed modifications is to make this paragraph more direct and easier to understand. The proposed amendments to UR.2.3.(b) are intended to clarify the meaning of the term "new" in references to "receiving containers" in the existing language. Research of the original language revealed references to receiving containers (or tanks) that were designed with what was then considered "new" top "spray-fill" systems.

Discussion of requirements and considerations for the use of LPG vapor return lines can be traced back as early as the 1950 NCWM Conference Report and can be found specifically in the 1956, 1957, 1958, and 1964 Conference Reports.

As product flows into the receiving (customer's) tank during an LPG delivery, the liquid compresses the vapor in the customer's tank, increasing pressures and temperatures inside the tank. As the pressure increases, some of the vapor condenses into liquid and equilibrium is eventually restored. However, such increased pressure can make deliveries difficult or impossible. At one time, vapor return lines were used to help equalize the pressures. These lines would allow some vapor in the receiving tank to be pushed back into the seller's tank, thus reducing pressure in the receiving tank during the delivery. The problem with this practice is that this vapor belongs to the customer and the vapor is not measured and no compensation is made to the customer for it.

The "spray-fill" design allows relatively cool product to "spray" over the insides of the tank as a delivery is being made, cooling the vapor space and promoting condensation of existing vapor in the tank, and reducing pressure buildup. The advent of the "spray-fill" design virtually eliminated the need for a vapor-return line connected to the supplier's tank and the receiving container except in specific circumstances where other constraints may necessitate its use.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee received comments in support of the proposal from Mr. Clark Cooney (California). Mr. Cooney indicated that he had helped develop the proposal while working for NIST. His research into the history of term "new receiving container," which appears currently in paragraph UR.2.3. Vapor Return Line, revealed that the term was intended to refer to a receiving container of new design that was first

introduced in the 1950s. This new design facilitated the cooling of product as it was received into the container, thereby, eliminating the need for a vapor-return line. This proposal is simply an attempt to make the language clearer.

Ms. Tina Butcher (NIST, OWM) reported that OWM routinely encounters questions about interpreting and applying the requirement as it is currently written. A vapor-return line allows vapor in the receiving tank to be displaced into the seller's tank. The line helps eliminate errors that can arise from the condensing of the vapor during testing; however, for a commercial transaction, that uncondensed product belongs to the customer. This proposal does not add anything new, but rather is an attempt to improve understanding of the requirement by changing the existing sentence structure and adding some additional clarification. The proposed language clarifies that the reference to the term "new" refers to a specific design of tank that was "new" when the language was first introduced many years ago.

Ms. Butcher noted that the words "at or above" should precede "90 °F (32 °C)" in (b) of the proposal. She also noted that the CWMA had suggested that additional detail is needed to define the conditions under which the use of a vapor-return line would be considered appropriate. OWM agrees that such detail would be beneficial, but suggests this be done as a separate effort rather than delaying the needed changes to the current paragraph. OWM also questions whether such guidelines might be best included in the NIST EPO.

Two regulatory officials from California commented that they too supported the proposal.

The Committee agrees with the justification to improve and clarify the current language in NIST Handbook 44 and that the words "at or above" need to be included as noted by OWM. Consequently, the Committee agreed to amend the proposal as shown in Item Under Consideration and present it for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearing, Ms. Tina Butcher (NIST, OWM) commented that OWM considers this proposal a "housekeeping" issue, which serves to provide additional clarification on what is meant by a "new" receiving container in bullet (b) of existing paragraph UR.2.3. Vapor-Return Line. Ms. Butcher stated that the reference to the term "new" refers to a specific design of tank that was "new" when the language was first introduced many years ago and which has created confusion regarding the interpretation of how the paragraph applies to specific systems. She further noted that the remaining changes proposed to the paragraph by OWM are simply intended to make the language easier to understand.

Mr. Dimitri Karimov (Liquid Controls), speaking on behalf of the MMA, stated that the MMA supports the changes proposed by OWM.

Hearing no comments in opposition and only comments in support of the changes proposed, the Committee agreed to present the item for Vote with no changes.

Regional Association Comments:
The WWMA received testimony from Ms. Tina Butcher at its 2015 Annual Meeting indicating this proposal doesn't change the requirement. It clarifies when a vapor return line is permitted. The WWMA S&T Committee agreed with her testimony. The WWMA forwarded the item to NCWM and recommended that it be a Voting item.

The CWMA reported, at its 2015 Interim Meeting, it believes this item needs more development, specifically defining under what conditions the use of a vapor return line would be allowed, to include but not be limited to, ambient temperature, tank pressure, and the condition of the delivery equipment. The CWMA forwarded this item to NCWM and recommended that it be a Developing item. However, at its spring 2016 Annual Meeting, the CWMA reported it believes the item is fully developed and recommended it move forward as a Voting item.

NEWMA indicated at its fall 2015 Interim Meeting that it does not think the purpose of this item is pertinent to NIST Handbook 44 and did not forward the item to NCWM, recommending that it be withdrawn. However, at its 2016 Annual Meeting, NEWMA indicated it believes the proposed changes will clarify the conditions for wholesale LPG and Anhydrous Ammonia LMD vapor return and recommended the item be forwarded to NCWM as a Voting item.

The SWMA forwarded this item to NCWM and recommended that it be a Voting item.

334 CRYOGENIC LIQUID-MEASURING DEVICES

334-1 V Table S.252. Categories of Sealing and Methods of Sealing (See Related Items 331-2, 332-4, 335-1, 337-1, 338-1, and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook 44, Cyrogenic Liquid-Measuring Devices Code as follows:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]
(Table Added 2006) **(Amended 2016)**

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See Item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See agenda Item 331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

335 MILK METERS

335-1 V Table S.2.2. Categories of Sealing and Methods of Sealing (See Related Items 331-2, 332-4, 334-1, 337-1, 338-1, and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook 44, Vehicle-Tank Meters Code as follows:

Table S.2.3. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 2016)**

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See Item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for Vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See agenda Item 331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1 and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

337 MASS FLOW METERS

337-1 V Table S.3.5. Categories of Sealing and Methods of Sealing (See Related Items 331-2, 332-4, 334-1, 335-1, 338-1, and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook 44, Mass Flow Meters Code as follows:

Table S.3.5. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 1995) (Amended 1995, 1998, 1999, ~~and~~ 2006, **and 2016**)

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See Item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for Vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together Agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See agenda

Item 331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

337-2 V Appendix D – Definitions: Diesel Liter Equivalent (DLE) and Diesel Gallon Equivalents (DGE) for Compressed Natural Gas and Liquefied Natural Gas; Definition of Gasoline Gallon Equivalent and Gasoline Liter Equivalent for Compressed Natural Gas; S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers; S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel; S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel; S.5.2. Marking of Diesel and Gasoline Volume Equivalent Conversion Factor; Compressed Natural Gas, S.5.3. Marking of Diesel Volume Equivalent Conversion Factor; Liquefied Natural Gas, UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas, UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas, and UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas

(This item was Adopted.)

Source:
Clean Vehicle Education Foundation (2014)

Purpose:
Since natural gas is sold in the retail market place as compressed natural gas (CNG) and liquefied natural gas (LNG) as an alternative fuel to gasoline and diesel fuel, the proposed additions and edits to NIST Handbook 44 will provide definitions for volume units of CNG and LNG that are the approximate energy equivalents for diesel and/or gasoline gallons so that end users can readily compare cost and fuel economy. At present, only equivalents for gasoline are included in NIST Handbooks 44 and 130 for CNG as an engine fuel. The proposal also includes modifications to Appendix D relative to the sale of LNG and CNG.

Item Under Consideration:
Amend NIST Handbook 44 Appendix D to include the following new definition:

diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]

(Added 2016)

Amend NIST Handbook 44, Appendix D definitions as follows:

gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 5.660 pounds of **compressed** natural gas. [3.37]

(Added 1994) **(Amended 2016)**

Delete the following NIST Handbook 44, Appendix D definition as shown:

~~**gasoline liter equivalent (GLE). Gasoline liter equivalent (GLE) means 0.678 kilograms of natural gas. [3.37]**~~

~~**(Added 1994)**~~

Amend NIST Handbook 44, Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1., and UR.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a compressed **or liquefied** natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.

(Added 1994) **(Amended 2016)**

S.1.3. Units.

S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel. – When compressed natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated **in ~~"gasoline liter equivalent (GLE) units" or~~ "**gasoline gallon equivalent (GGE) units**" or diesel gallon equivalent units (DGE), or in mass.** (Also see Appendix D definitions.)

(Added 1994) **(Amended 2016)**

S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel. – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in diesel gallon equivalent units (DGE) or in mass. (Also see definitions.)

(Added 2016)

S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement **~~"1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or~~** "1 Gasoline Gallon Equivalent (GGE) ~~is Equal~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994) **(Amended 2016)**

S.5.3. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2016)

S.6. Printer. – When an assembly is equipped with means for printing the measured quantity, the following conditions apply:

(a) the scale interval shall be the same as that of the indicator;

(b) the value of the printed quantity shall be the same value as the indicated quantity;

(c) ***the printed quantity shall also include the mass value if mass is not the indicated quantity; [Nonretroactive as of January 1, 2021]***

(~~c~~ **d**) a quantity for a delivery (other than an initial reference value) cannot be recorded until the measurement and delivery has been completed;

(~~d~~ **e**) the printer is returned to zero when the resettable indicator is returned to zero; and

(~~e~~ **f**) the printed values shall meet the requirements applicable to the indicated values.

(Amended 2016)

UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Gallon Equivalent (GGE) means 5.660 lb of Compressed Natural Gas" or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2016)

UR.3.1.2. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2016)

UR.3.8. Return of Product to Storage, Retail Compressed and Liquefied Natural 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.

(Added 1998) **(Amended 2016)**

Background/Discussion:
A gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. More background on this work is available in the Reports of the 78th and 79th NCWM in NIST Special Publications 854 and 870 (see pages 322 and 327, respectively). Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG). For medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The submitter has provided a mathematical justification for the specific quantity (mass) of compressed natural gas in a DLE and DGE, which is included in Appendix F.

See the Committee's Final Reports from 2014 and 2015 to review previous language and positions to amend NIST Handbook 44, Mass Flow Meters Code to allow for the sale of natural gas used as an engine fuel by volume equivalent units of gasoline and diesel.

2016 NCWM Interim Meeting:
The Committee heard over a dozen comments on this item, many in support of the Item Under Consideration as written and some opposed. Many of the comments were similar to what had been heard by the Committee at prior meetings. Dr. Matthew Curran (Florida) raised concerns about the weights and measures community losing credibility if it can't address this issue since exactly the same proposal was voted on and stalled in a tied vote at the last two NCWM annual meetings, and now states are beginning to use their own factors. The Internal Revenue Service was looking for the NCWM to address this issue last July, but since it again did not pass, they proceeded with their own values. The Southern Weights and Measures Association Voted on and put forth an alternate proposal (listed in NCWM Publication 15, page A-79) that added a requirement for mass to be displayed to the consumer simultaneously or in an alternating fashion with the gallon equivalent unit or via consumer controls on the dispenser to allow the consumer to choose to see the reading in either mass or volume equivalents. He further noted that the dispensers

already show readings in mass (only to the weights and measures official though) and volume equivalents so why not make them both visible to the consumer.

Mr. Randy Moses (Dresser Wayne), a CNG dispenser manufacturer, was opposed to the Florida proposal and said they were not likely going to dual displays, since this could be even more confusing to consumers. He also pointed out implications with point of sale systems. He supported the Item Under Consideration in NCWM Publication 15.

Mr. Ross Andersen (New York, retired) pointed out that an acceptable practice occurs when buyers and sellers agree on a method of sale, as is the case in the use of gallon equivalent units that have been accepted in the marketplace since 1994. Mr. Mike Sikula (New York) stated the State of New York supports the item.

Mr. Mahesh Albuquerque, (Colorado) supported the item as proposed. He mentioned that the State of Colorado had adopted method of sale regulations for retail natural gas in 2014 that were identical to the Item Under Consideration, and has been able to implement them effectively with no marketplace concerns. He urged the Conference to consider adopting the Item Under Consideration as presented in NCWM Publication 15. He did not support the alternative dual display proposal that was discussed at the SWMA.

Ms. Tina Butcher (NIST, OWM) raised technical concerns if commercial transactions were not in traceable units, which is in mass for CNG and LNG sales. The OWM also was concerned with the numerical values used in deriving the DGE and the DLE. She discussed the OWM comments included in NCWM Publication 15 and provided in OWM's technical analysis of the item for the Committee. She also noted that the SWMA proposal appears to provide a reasonable compromise, but encouraged the Committee to consider potential dispenser displays and ensure necessary requirements are included in the proposal that all information displayed to a customer would be clear and understandable.

Ms. Angela Godwin (Ventura County, California) opposed the item. She agreed with OWM's comments. Mr. Ron Hayes (Missouri) also opposed the item under consideration and supported the SWMA alternative proposal.

Mr. Jeff Clarke (NGVAmerica) supported the Item Under Consideration and urged the Conference to move it forward. He mentioned several trade associations had also submitted letters of support to all regions. With regard to the alternate proposal discussed at the SWMA, he said it needed to be clear that the primary method of sale needs to be in equivalent units.

Ms. Paige Anderson (Sigma NACS) supported the item and stated her members had questions related to the SWMA's alternative proposal. Mr. Brett Barry (Clean Energy) supported the item as written.

After the open hearings, the S&T and L&R Committees met jointly to discuss all the CNG and LNG items on their respective agendas. In consideration of all of the comments heard, and at the suggestion of Mr. Ethan Bogren, the S&T Committee agreed to add a requirement to the Item Under Consideration that the mass value be included on the printed receipt, if not displayed on the dispenser. The Committee added a modification to paragraph S.6.(b) that would require printed receipts to include the equivalent mass value if mass is not the indicated quantity effective January 1, 2018.

2016 NCWM Annual Meeting:
The Committee heard numerous comments on this item, many in support of moving the Item Under Consideration forward as written or with some modification and some opposed. Some of the comments were similar to what had been heard by the Committee at prior meetings.

Mr. Jeff Clarke (NGVAmerica) supported the item with a proposed modification. He stated that LNG is used in large trucks, and the DGE is more widely accepted nationally and accepted at the federal level for taxation purposes. Because of concerns related to POS capabilities, he suggested a change to the printed receipt that would include the conversion factor (instead of the mass value) and would allow a consumer to calculate the mass delivered. His suggested changes were included in his letter, which had been posted on the NCWM website. He urged adoption of this standard for consistency and requested the Conference to move it forward.

Mr. Randy Moses (Wayne), a CNG dispenser manufacturer, also raised concerns related to the printing GGE/DGE and mass units on receipt. He said to minimize consumer confusion the information displayed on the dispenser should be the same as what is on the printed receipt.

Ms. Tina Butcher (NIST, OWM) raised technical concerns if commercial transactions were not in traceable units, which is in mass for CNG and LNG sales. She also questioned the accuracy of the conversion factor.

Mr. Steve Harrington (Oregon) supported the proposal noting there needs to be consistency in the marketplace.

Dr. Matt Curran (Florida), speaking on behalf of FALS, expressed support for companion L&R Item 237-1.

Mr. Scott Simmons and Mr. Mahesh Albuquerque both of Colorado stated that Colorado had adopted the DGE for CNG and LNG in regulations back in 2014 and have had no consumer concerns since its adoption. Colorado recognizes the sale of CNG and LNG in mass or gallon equivalent units, and requires that the printed receipt include the same unit of sale as displayed on the dispenser.

Several other W&M officials including Ms. Julie Quinn (Minnesota), Mr. Joe Gomez (New Mexico), Mr. Mike Sikula (New York), Mr. Tim Chesser (Arkansas), Mr. Ethan Bogren (Westchester County, New York), and Dr. Curran also expressed support for the item and urged the Conference to move it forward as a Voting item. Dr. Curran further clarified the intent of his dual display proposal by stating that it basically shows the consumer the mass reading that weights and measures officials can already see now.

Mr. Ron Hayes (Missouri) and Ms. Angela Godwin (Ventura County, California) spoke in support of mass and the NIST proposal.

Several industry members, including Mr. Tim Columbus (Steptoe and Johnson, LLP), Mr. Mike Bailey (Bailey Enterprises, Inc.), Mr. Brett Barry (Clean Energy), Mr. Prentiss Searles (API), Mr. Russ Lewis (Marathon Petroleum Company), and Ms. Sherrie Merrow (NGVAmerica) spoke in support of volume equivalents and Mr. Clarke's changes, and in moving the item forward.

The S&T Committee and L&R Committee met jointly during their work sessions to consider this item and companion L&R Items 232-8 and 237-1. There were quite a number of industry representatives, weights and measures officials, and others in attendance to witness, and, if requested by the committees, contribute to the discussions. In considering the comments from the open hearings, it was mentioned by a member of one of the committees that industry seemed somewhat opposed to providing the mass indication on the printed receipt. Members of the two committees then shared opinions on how best to proceed given industry's somewhat negative posture on this issue. There was general agreement that the current proposal represented a comprise of the two opposing sides with respect to the method of sale of natural gas. A committee member suggested, in an effort for the two committees to be able to present a proposal in which both sides of the MOS argument might agree, that additional time be granted for industry to comply with having to record the mass value on the printed receipt. Members of both committees liked the suggestion. Consequently, members of the S&T Committee agreed to change the formatting of paragraph S.6. Printer of the proposal that the portion of the paragraph requiring the mass value to be recorded be nonretroactive as of January 1, 2021. No additional changes were made to the proposal. The Committee then agreed to present the item, as shown in Item Under Consideration, for Vote.

Regional Association Comments:
The WWMA received testimony in support of this proposal from several regulators. One regulator gave testimony strongly opposing gallon equivalents. In addition, many stakeholders submitted written support for this item. One regulator noted that this issue needs to be addressed and resolved by the weights and measures community and should not be left up to other entities performing end-runs with state legislatures. The WWMA recommended that this be a Voting item.

The CWMA reported its members have been unable to come to a consensus as to whether the use of equivalency units is appropriate, but they believe that this proposal should be Voted on, on the basis of its merit. At both its 2015 Interim Meeting and 2016 Annual Meeting the CWMA recommended that this item be a Voting item.

NEWMA supported the item and recommended it be forwarded to NCWM as a Voting item at both its 2015 Interim Meeting and 2016 Annual Meeting.

At its fall 2015 Annual Meeting, the SWMA felt that a compromise version needed to be developed and forwarded because more votes for "mass" or "volume equivalents" would likely result in another failure to pass a method of sale and establish equivalencies for these products. Members of the SWMA S&T Committee also expressed concern that further delay could damage the future reputation of the Weights and Measures Community. Other agencies and states are now moving forward independently of the NCWM and, thus, lessening our relevance in the area of commerce one piece at a time. The SWMA believes that, while its recommended proposal may not completely satisfy all corners of this debate, it is the best overall compromise to date for all interested parties. The SWMA further noted that anyone opposing such a compromise version is more than welcome to provide an alternative. This proposal provides for the display of both "mass" and "volume equivalent" units and gives the dispenser manufacturers a future non-retroactive implementation date for installation so devices in service prior to the effective date would not have to be converted, only when replaced with new devices. The SWMA recommended the following compromise proposal as a Voting item:

Amend NIST Handbook 44, Appendix D to include the following new definition:

diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]

(Added 2016 ~~2015~~)

Amend NIST Handbook 44, Appendix D definitions as follows:

gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 5.660 pounds of **compressed** natural gas. [3.37]

(Added 1994) (Amended **2016 ~~2015~~**)

Delete the following NIST Handbook 44, Appendix D definition as shown:

~~**gasoline liter equivalent (GLE). Gasoline liter equivalent (GLE) means 0.678 kilograms of natural gas.[3.37]**~~

~~**(Added 1994)**~~

Amend NIST Handbook 44, Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1., and UR.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a compressed **or liquefied** natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.

(Added 1994) **(Amended 2016 ~~2015~~)**

S.1.3. Units.

S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel. – When compressed natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in ~~**"gasoline liter equivalent (GLE) units" or "**~~gasoline gallon equivalent (GGE) units~~**"**~~ **or diesel gallon equivalent units (DGE), and ~~or~~ in mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls.** (Also see Appendix D definitions.)

(Added 1994) (Amended **2016 ~~2015~~) (Nonretroactive as of January 1, 2020)**

S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel. – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in diesel gallon equivalent units (DGE) and ~~or~~ in mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls. (Also see definitions.)

(Added 2016 ~~2015~~) (Nonretroactive as of January 1, 2020)

S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement **~~"1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or~~** "1 Gasoline Gallon Equivalent (GGE) **~~is Equal~~ means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994) **(Amended 2016 ~~2015~~)**

S.5.3. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Amended 2016 ~~2015~~)

UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Gallon Equivalent (GGE) means 5.660 lb of Compressed Natural Gas" or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Added 2016 ~~2015~~)

UR.3.1.2. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Added 2016 ~~2015~~)

UR.3.8. Return of Product to Storage, Retail Compressed and Liquefied Natural 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.

(Added 1998) **(Amended 2016 ~~2015~~)**

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

337-3 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item under Consideration:
Amend NIST Handbook 44, Mass Flow Meters Code as follows:

N.3. Test Drafts.

N.3.1. Minimum Test – Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.

(Amended 1982 **and 20XX**)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

(Added 20XX)

Background/Discussion:
The use of transfer standards is recognized in code Sections 3.34. Cryogenic Liquid-Measuring Devices Code and 3.38. Carbon Dioxide Liquid-Measuring Devices Code, and 3.39. Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues and is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in NIST Handbook 44 will enable states to allow transfer standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a master meter to test propane delivery truck meters. The State of Nebraska has used a mass flow meter to test agricultural chemical meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice; however, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Mass Flow Meters Code paragraph U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The S&T Committee might also consider amending Sections 3.30. Liquid-Measuring Devices Code and 3.31. Vehicle-Tank Meters Code to allow transfer standard meters.

See the 2015 S&T Committee's Annual Report (in NIST SP 1210) for additional background information and to review previous language and positions on this proposal.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. See Item 332-5 for a summary of the comments received during the Committee's open hearings and the Committee's discussions and considerations concerning these two items. Based on the comments received during the open hearings, the Committee agreed to present both items for Vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. See Agenda Item 332-5 for a summary of comments heard on these two

items. In consideration of the comments received, the Committee, by Vote of its majority members, agreed to downgrade the status of these two items to Developing and return them to the submitter.

Regional Association Comments:
The WWMA did not receive any comments on this item its 2015 Annual Meeting. The WWMA sees possible merit in the proposal, but believes that refinements and more test data are needed before further consideration can be given to this item and recommended that this item remain as a Developing item.

At its fall 2015 Interim Meeting, the CWMA reported it believes the type of meter that could be considered appropriate for use as a transfer standard meter needs to be further defined. At its spring 2016 Annual Meeting, the CWMA reported it feels this item has merit and the comments received were in support of the use of transfer standards once the proper procedures have been developed to insure accuracy, traceability, and suitability. The CWMA recommended the status of the item be Developing at both meetings.

At its fall 2015 Interim Meeting, NEWMA recommended that this item remain as a Developing item. At its 2016 Annual Meeting, NEWMA recommended an Information status be assigned to this item and reported it feels there is not enough data to support the item at this time.

At its fall 2015 Annual Meeting, the SWMA batched this item with Item 332-5 and heard them together. The SWMA recommends that these items be Voting items.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

338 CARBON DIOXIDE LIQUID-MEASURING DEVICES

338-1 V Table S.2.5. Categories of Sealing and Methods of Sealing (See Related Items 331-2, 332-4, 334-1, 335-1, 337-1, and 339-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item under Consideration:
Amend NIST Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

Table S.2.5. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 2016)**

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search than the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See Item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for Vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See agenda Item

331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to the NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1 and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

338-2 V S.3.1. Vapor Elimination

(This item was Adopted.)

Source:
NIST Office of Weights and Measures (2016)

Purpose:
1. To require that the vapor eliminator on carbon dioxide liquid-measuring devices be automatic in operation;

2. To edit the vapor eliminator requirements to ensure clarity and consistency with other measuring codes; and

3. To require that vapor elimination vent lines be made of a non-collapsible material.

Item under Consideration:
Amend NIST Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

S.2.1. Vapor Elimination.

(a) A ~~**measuring system**~~ **device** shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the ~~**measurement**~~ **passage** of vapor ~~**that will cause errors in excess of the applicable tolerances**~~ **through the meter**.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 2016)

Background/Discussion:
The proposed changes to S.2.1. would clarify that the carbon dioxide liquid-measuring device's vapor eliminator must be automatic in operation and prevent both air and vapor from passing through the meter. Effective operation should not depend on operator intervention or action. Additionally, the proposed changes would require that the vent lines be made of material that resists the potential obstruction (e.g., bending or kinking) that may otherwise prevent the free-flow of air and vapor out of the metering system. Non-rigid vent lines would facilitate fraud and may lead to improper operation of the air/vapor elimination system. These modifications would more closely align the requirements with corresponding requirements in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting open hearings, the Committee grouped Items 332-3 and 338-2 together and took comments simultaneously on these items. See Item 332-2 for a summary of the comments received during the open

hearings on these two items. Based on the comments received during the open hearings, the Committee agreed to amend the proposal as shown in Item Under Consideration and present it for Vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped together Items 332-3 and 338-2 and comments were taken simultaneously since the Committee considered them companion items. See Item 332-2 for a summary of the comments received and the actions taken by the Committee on these two items.

Regional Association Comments:
The WWMA's S&T Committee did not receive comments on this item during the open hearings of the WWMA's 2015 Annual Meeting. During Committee discussions, the WWMA S&T Committee agreed that this proposal contains clean-up language to align this section with other codes in NIST Handbook 44. The Committee also noted, as it did during its discussions on Item 332-3, that the requirement that the vent lines be constructed of rigid materials is important. The WWMA believes this item is fully developed and forwarded it to NCWM, recommending that it be a Voting item.

At its fall 2015 Interim Meeting, the CWMA requested that the terminology be reviewed for technical reasons specifically the inclusion of the term "air." The CWMA forwarded the item to NCWM and recommended that it be a Voting item at both its 2015 Interim Meeting and 2016 Annual Meeting.

NEWMA commented, at its 2015 Interim Meeting, that the original language in NIST Handbook 44 is appropriate since air should not be present in a pressurized system. NEWMA recommended this item be Withdrawn. However, at its 2016 Annual Meeting, NEWMA recommended the item be forwarded to the NCWM as a Voting item.

At its fall 2015 Annual Meeting, the SWMA batched this item with Item 332-3 and head them together. The SWMA recommends this new language based on comments received. The SWMA forwarded the items to NCWM and recommended that they be Voting items.

339 HYDROGEN GAS-METERING DEVICES

339-1 V Table S.3.3. Categories of Sealing and Methods of Sealing (See Related Items 3312, 3324, 3341, 3351, 337-1, and 338-1)

(This item was Adopted.)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information.

Item Under Consideration:
Amend NIST Handbook 44, Hydrogen Gas-Measuring Devices Code as follows:

Table S.3.3. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods 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* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

(Amended 2016)

Background/Discussion:
This amendment and similar proposals to amend other codes in Section 3 of NIST Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30. Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and comments were taken simultaneously on these items since they are considered companion items. See Item 331-2 for a summary of the comments received by the Committee on these items.

The Committee agreed that these proposals would harmonize the language for sealing Category 3 devices in each of these metering codes and, consequently, agreed to recommend each item for Vote.

2016 NCWM Annual Meeting:
At the Committee's 2016 NCWM Annual Meeting open hearings, the Committee grouped together agenda Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and took comments simultaneously on these items. See agenda Item 331-2 for a summary of the comments received on these items during the Committee's open hearings and the resulting actions taken by the Committee on these items.

Regional Association Comments:
The CWMA reported, at its spring 2016 meeting, that no comments were heard on this item and recommended it be forwarded to the NCWM as a Voting item.

NEWMA agrees that these proposals would harmonize the language for sealing Category 3 devices in the codes addressed by each of these Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1. At both its 2015 and 2016 Annual Meetings, NEWMA recommended these be forwarded to the NCWM as Voting items.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 331-2, 332-4, 334-1, 335-1, 337-1, 338-1, and 339-1 and all items were heard together. The SWMA agrees with adding this language and harmonizing it with the LMD Code and recommended to the NCWM that they be Voting items.

339-2 V Table T.2. Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices.

(This item was Adopted.)

Source:
California (2016)

Purpose:
Temporarily broaden tolerances to reflect the actual capability of the devices.

Item under Consideration:
Amend NIST Handbook 44, Hydrogen Gas-Measuring Devices Code as follows:

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~~ 7.0	Hydrogen gas as a vehicle fuel	~~1.5 %~~ 5.0 %	~~2.0 %~~ 7.0 %

(Amended 2016)

Background/Discussion:
The NIST Handbook 44 accuracy tolerances (1.5 % acceptance tolerance and 2.0 % maintenance tolerance) are currently not achievable by manufacturers of hydrogen dispensers.

Between 2009 and 2013, several manufacturers applied to the California Type Evaluation Program (CTEP) for approval of their hydrogen dispensers but none were able to successfully pass type evaluation with the existing NIST Handbook 44 tolerances. To overcome this, California promulgated regulations in 2014 to temporarily relax the accuracy tolerances found in NIST Handbook 44. Since that time, there have been three manufacturers who have successfully completed type evaluation of their hydrogen gas-measuring devices under the new regulations. Unless the accuracy tolerances of Section 3.39. are temporarily widened, other states will face the same dilemma experienced by California, and NTEP will not be able to issue Provisional Certificates allowing the commercial use of these devices.

A statement in the 2012 U.S. Department of Energy's Request for Information regarding hydrogen gas-measuring devices summarizes the current dilemma quite well:

> In order to enable the commercialization of hydrogen, fueling equipment that meets measurement standards must be available to sell hydrogen fuel to the public by weight or volume. Based on available information, no commercially available devices are capable of meeting the National Institute of Standards and

Technology's (NIST's) NIST Handbook 44 measurement accuracy requirements for hydrogen while being used under fueling conditions….

It is recognized that error-free, perfect performance of mechanical equipment is unattainable. Accuracy tolerances are established to fix the legal range of accuracy within which equipment will be officially approved for commercial use. Tolerance values should be sufficiently small so that no serious injury to either the buyer or seller occurs. Consumers (and hydrogen fueling station owners) will be impacted by the proposed amendments, which would temporarily relax the accuracy tolerances from ± 2 % to ± 10 %.

However, it is important to balance consumer protection with the equipment currently available for use. In order to commercialize FCEV and allow the legal sale of hydrogen in the United States, it is necessary to set accuracy tolerances that can be achieved at this time. There is only one Coriolis mass flow meter make and model available for purchase today by manufacturers wishing to build a commercial hydrogen gas-measuring device. When hydrogen fuel cell vehicles gain consumer acceptance and a profitable business model exists for equipment manufacturers, it is anticipated that companies will expend the research and development dollars to develop more accurate meters.

Sunset dates (2018 for installation of Accuracy Class 10.0 devices and 2020 for installation of Accuracy Classes 3.0 and 5.0 devices) are included to make clear that these relaxed tolerances are temporary. As technology advances and more accurate devices can be built, hydrogen gas-measuring devices will move into a more accurate or "better" accuracy class. Sunset dates also obligate the NCWM or the NIST-led USNWG for the Commercial Development of Hydrogen Measurement Standards to conduct a review of the accuracy tolerances as more data becomes available.

Hydrogen dispensers being tested today by the California Division of Measurement Standards are able to meet the expanded tolerances. Most, but not all, manufacturers have equipment that can achieve at least Accuracy Class 5.0. A summary of California's test data will be made available by January 2016 at the NCWM Interim Meeting.

In most states within the United States, the transportation sector is the biggest contributor to air pollutants, including greenhouse gas emissions. To improve air quality, states like California are attempting to facilitate the commercialization of Zero Emission Vehicles (ZEV), which include hydrogen-powered fuel cell vehicles (FCEV). However, the commercialization of hydrogen fueling stations is one of the biggest critical barriers preventing the widespread market penetration of hydrogen-fueled vehicles, and the current NIST Handbook 44 tolerances for hydrogen dispensers are too restrictive.

The inability of manufacturers to comply with current NIST Handbook 44 tolerances is partly due to potential hydrogen embrittlement of the tanks, a safety concern since the service pressures at which hydrogen is dispensed are very high (35 mPA and 70 mPA, or 5000 psi and 10 000 psi, respectively).

The Governors of eight states (California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont) signed a Memorandum of Understanding in 2013 to put 3.3 million zero-emission vehicles on roads by 2025; 15 % of new vehicle sales. Car manufacturers are launching hydrogen-powered FCEV vehicles in California today, with statements that their next steps are to establish an East Coast Hydrogen Highway in states surrounding the New York and Boston regions, specifically, New York, New Jersey, Massachusetts, Connecticut, and Rhode Island.

2016 NCWM Interim Meeting:
During the Committee's 2016 NCWM Interim Meeting open hearings, Mr. Kevin Schnepp (California) provided an explanation of the basis for the submission of this item and recommended it move forward with a Voting status. Further, he requested that NIST reconvene the USNWG for hydrogen measurement standards to assign tolerances to the different classes.

Ms. Tina Butcher (NIST, OWM) stated NIST OWM supports expanding the tolerances if current equipment is unable to comply, but doesn't believe multiple tolerances for the same device are appropriate. If multiple tolerances are provided, there would be no incentive for companies to strive to improve accuracy of their equipment. Additionally, four different sets of tolerances for the same application would tend to create unfair competition amongst equipment manufacturers and the refueling station businesses.

Ms. Butcher noted that multiple tolerances frustrate value comparison. She asked everyone to consider two dispensers located at competing businesses; the first having a 10 % accuracy classification and set to compute at a lower unit price and the second dispenser, which has an accuracy classification of 5 % and set to compute at a higher unit price. How is a customer to determine which offers the better value? Ms. Butcher indicated that it is unnecessary to offer larger tolerances than the smallest tolerance that can be reasonably achieved. It isn't advisable to collect data and set tolerances based on the lowest common denominator, but rather, consider what most equipment can reasonably achieve. Ms. Butcher suggested that if equipment cannot meet the current 2 % maintenance/1.5 % acceptance tolerance, why not propose a single tolerance structure that can be met, (e.g., 5 % maintenance/3 % acceptance) providing it is agreed that such tolerances won't cause serious injury?

Ms. Butcher further noted that the proposal refers to the dates provided in footnote 1 and footnote 2 as "sunset" dates. OWM views these as phase-in dates; not sunset dates. There are no phase-out dates provided in the proposal. A 10.0 Accuracy Class device installed today could still be in use 25 years (or more) provided it continues to comply with NIST Handbook 44.

Ms. Kristin Macey (California) commented that she would appreciate the opportunity to share with everyone the data collected by California. She further indicated that the data is from "real world" testing and that she knew of no other meters in existence, other than those that had been tested in California.

Mr. Mike Sikula (New York), Mr. Mahesh Albuquerque (Colorado), Mr. Dwight Zuck (Air Liquide Advanced Technology), Mr. Ron Hasemeyer (Alameda County, California), and Mr. Charlie Myers (U.S. Department of Energy) supported the proposal.

Mr. Michael Keilty (Endress + Hauser Flowtec) recommended this remain a Developing item as he was concerned that the larger tolerances proposed are not appropriate for commercial metering, but rather intended for equipment used in a monitoring application. He felt the proposal would allow sub-standard systems to enter the market as opposed to requiring these systems to be updated. Mr. Kevin Schnepp (California) followed up by adding that the California test data was acquired from recently installed devices, as opposed to older devices, and that all of the meters tested use mass-flow meter technology. Mr. Dmitri Karimov (Liquid Controls) expressed concern over multiple tolerances for a single device and asked if this was deemed appropriate for these devices, why not for others as well?

In response to several comments regarding multiple tolerances for a single device, Mr. Mahesh Albuquerque (S&T Chair) suggested adding only the 10.0 accuracy class for use until January 1, 2020, after which all hydrogen measuring devices would need to comply with the requirements of the existing 2.0 accuracy class. This would give industry time to design equipment to meet the requirements of the 2.0 accuracy class. Mr. Kevin Schnepp (California), Mr. Charlie Myers (U.S. Department of Energy), and Mr. Dwight Zuck (Air Liquide Advanced Technology) recommended a 10 % tolerance if one had to be chosen.

During its work session, the Committee elected to amend the proposal to include the 10.0 accuracy class with 5 % and 10 % acceptance and maintenance tolerances, respectively with a sunset date of January 1, 2020, after which all hydrogen measuring devices would need to comply with the requirements of the 2.0 accuracy class. Further, the Committee also elected to delete footnote 1 and edit and renumber footnote 2 as footnote 1. The Committee agreed to present the item for Vote at the Annual Meeting. The changes agreed to by the Committee are reflected in the Item Under Consideration.

2016 NCWM Annual Meeting:
During the open hearings, Ms. Kristin Macey (California) spoke in favor of amending the accuracy classes and tolerances in the tentative code. She indicated data collected by California shows that existing devices in the marketplace cannot meet the tolerances in the current tentative code, supporting the necessity for changes to Table T.2 to broaden the tolerances. California has collected data for acceptance tolerance, but not maintenance tolerance. In response to comments to downgrade the item to Information until additional data was available, Ms. Macey recommended the Committee strike out accuracy class 2.0 and move the item forward. She also indicated that she was not opposed to a single accuracy class with 5 % and 7 % acceptance and maintenance tolerances, respectively.

Ms. Tina Butcher (NIST, OWM) expressed concern with the 10 % tolerance; saying that OWM believes it is too large. She supported eliminating the tighter tolerance of 1.5 % and 2.0%, and suggested that dispensers seem to be able to

meet 4 % or 5 %. She was in favor of a single accuracy class (though not at a level of 10 %) and said that multiple tolerances frustrate consumers and do not promote industry competition. She also noted that "phase in" or "sunset" dates might allow the perpetuation of equipment in the marketplace with multiple tolerance levels. Ms. Butcher also was not sure whether NTEP would evaluate devices under a tentative code. She recommended changing the status of the item to Information to allow time to gather more data.

Mr. Michael Keilty (Endress + Hauser Flowtec) reported that he had participated in the Hydrogen Work Group teleconference and stated that the number of devices tested thus far is only 15, which is a small number. He said the real data showed tolerances more like 4 % on acceptance and 6 % on maintenance. He agreed with Ms. Butcher's comments that multiple tolerances are confusing. He, too, recommended the status of the item be changed to Informational.

Mr. Mike Sikula (New York) encouraged changes be made to recognize larger tolerances.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, recommended the status of the item be changed to Informational and commented that having two tolerances for the same application is confusing.

Mr. Mahesh Albuquerque (Colorado) stated that Colorado recently adopted rules for hydrogen measurement and he supports the proposed changes to the tentative code. He didn't believe the two tolerances with the associated sunset date was a problem.

Mr. Jim Truex (NTEP) provided clarification that NTEP does not make decisions as to whether to evaluate a device; it has to come from NIST Handbook 44. NTEP will issue a provisional certificate if stated in a tentative code.

During its work session, the Committee agreed to amend the proposal as shown in Item Under Consideration based on comments received during the open hearings.

Regional Association Comments:

At its 2016 Annual Meeting, the CWMA indicated, based on the fact that this item includes an expiration date of January 1, 2020, it recommends this as a Voting item to allow further data gathering and further development of infrastructure related to Hydrogen fuel and to allow meters to be developed that are capable of greater accuracy.

NEWMA commented, at its 2015 Interim Meeting, that tolerances must allow for the current inaccuracies due to high changing pressures and varying temperatures in order to prevent holding back the advancement of technology. NEWMA forwarded the item to the NCWM, recommending it as a Voting item. At its 2016 Annual Meeting, NEWMA commented the Hydrogen Gas-Measuring Devices Code is a tentative code and these changes are appropriate while additional test data is being collected.

The SWMA S&T Committee commented that it understands and appreciates the intent of the proposal, but there were several concerns elevated during the open hearings and, thus, the item needs further development. The SWMA encourages NIST to work with the submitter to develop this item. The SWMA forwarded the item to the NCWM and recommended that it be a Developing item.

354 TAXIMETERS

354-1 V S.1.2. Advancement of Indicating Elements.

(This item was Adopted.)

Source:
NIST USNWG on Taximeters (2015)

Purpose:
To recognize that: (1) when the use of flat rates or negotiated rates are permitted as passenger charges, the entry of a flat rate or negotiated rate must result in that charge being displayed on the primary indicating element and, if applicable, through the recording element; and (2) at the time a transaction has been completed, there shall be no further advancement of indicated customer charges.

Item under Consideration:
Amend NIST Handbook 44, Taximeter Code as follows:

A.2. Exceptions. – This code does not apply to:

(a) **Odometers** ~~**odometers**~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) Devices that only display a flat rate or negotiated rate.

(Amended 1977 **and 2016**)

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism.

At the conclusion of a transaction (e.g., following the totalizing of all accrued charges and having a customer receipt made available), no other advancement of fare, extras or other charges shall occur until the taximeter has been cleared.
[Nonretroactive as of January 1, 2017]

Where permitted, a flat rate or negotiated rate shall be displayed in the "fare" indicating mechanism, provided that once a flat rate or negotiated rate is entered the fare may no longer be advanced by movement of the vehicle or the time mechanism.

(Amended 1988 **and 2016**)

Background/Discussion:
This amended proposal is a follow-up to a proposal that was submitted for consideration during the previous cycle (2014 - 2015) of regional weights and measures association meetings. That proposal was subsequently listed on the 2015 NCWM Annual Meeting agenda as a Voting item; however, during that meeting it was requested that the status be changed to Informational to allow for further development by the USNWG on Taximeters. The S&T Committee honored that request, and the status was changed to Informational. This item has been revised by the USNWG and is now being re-submitted with a recommendation from the work group that it be considered as a Voting item.

The use of non-incrementing (fixed amount) customer charges resulting from the application of a flat or negotiated rate in some jurisdictions is not addressed in NIST Handbook 44 Taximeters Code requirements. Where the use of this type of charge is permitted, those customer charges will normally be displayed on the primary indicating element in the display area reserved for "fare." The customer charge based on these particular types of rates do not align with the definition found in NIST Handbook 44, Appendix D for "fare" because the charge is not based on distance traveled or time elapsed. Some confusion over the interpretation of the existing requirement has been reported to the USNWG on Taximeters due to the use of flat rates and the resulting passenger charges being displayed by the taximeter in a display area reserved for "fare." The charge to the passenger resulting from the use of a flat or negotiated rate, when

entered, will cause the indicating element to change from zero or a no-charge to the amount that is associated with the flat or negotiated rate. This change from no charge to the value of the flat/negotiated rate has been interpreted by some as an advancement of the indicating elements. To account for this change in the displayed amount, the amendments shown above are being proposed by the USNWG on Taximeters.

Additionally, it was reported to the USNWG on Taximeters that during the type evaluation of a particular taximeter system, an advancement of the indicating element was observed after the passenger charges had been totaled and a receipt was printed. The members of the USNWG on Taximeters have determined that the indication of passenger charges should not continue to advance after the completion of a transaction and before the taximeter has been cleared of that transaction's data. Because there is no current requirement that addresses this advancement of indications after the completion of a transaction, the proposed amendment as shown is being recommended by the USNWG.

A number of jurisdictions are reportedly allowing the use of flat (fixed) rates to assess passenger charges for frequently traveled routes such as those trips between hotel/business districts and nearby airports. Some jurisdictions are also permitting the use of a negotiated rate that results in a passenger being charged by an amount that has been agreed upon by the passenger and driver. While these types of charges are not a product of calculations made by a commercial measuring device, taxicab owners/operators benefit from having those charges processed through a taximeter for documentation of vehicle use, revenue verification, invoicing, etc. In those cases, the flat/negotiated charges are to be entered into the taximeter and displayed by that commercial measuring device. For that reason, the USNWG believes that it is appropriate to recognize this practice and to regulate how those passenger charges appear and are displayed on the device. The requirement to have those fixed amounts displayed on the primary indicator and through the recording element will provide the passenger with a visual display of the charges assessed.

See the Committee's 2015 Annual Report for additional background information and to review previous language and positions to amend NIST Handbook 44, Taximeters Code.

2016 NCWM Interim Meeting:
At the its 2016 NCWM Interim Meeting open hearings, the Committee agreed to group together agenda Items 354-1, 354-2, 354-3, and 354-4 and take comments simultaneously on these items.

Mr. Ross Andersen (New York, retired) indicated that with respect to Item 354-1, he supported adding the "Note," but recommended deleting the proposed sentence, "No advancement of fare, extras, or other … issued." He stated that if an operator prints a receipt, it must cause the transaction to clear.

Mr. John Barton (OWM/NIST Technical Advisor to the USNWG on Taximeters) reported that Item 354-1 is a carry-over item from the 2015 NCWM Annual Meeting during which the item's status was downgraded from Voting to Informational to allow the WG an opportunity to further revise the proposal to address concerns regarding the use of the terms "fare" and "flat rate" in the proposal.

Mr. Barton noted that the use of "flat rates" is permitted by some jurisdictions as the non-incrementing fares charged in specific instances where a flat rate would be used instead of a fare that does increment based on time elapsed and/or distance traveled. A "flat rate" does not meet the definition of "fare" in NIST Handbook 44, Appendix D, which specifies that "fare" is a charge based on time and/or distance measurement and is automatically calculated by the taximeter rather than manually entered. While a flat rate charge is not considered a fare, when used in a jurisdiction that permits it, the flat rate amount is most often displayed by a taximeter in the area designated "fare." If not for the display of a customer charge in the form of a flat rate on the indicating element (taximeter), the use of flat rates might not be considered a weights and measures concern. However, since flat rate charges are presented to the customer via taximeter, they become an integral element of a commercial transaction involving a measuring device.

When a trip/transaction is initiated that will be based upon a flat rate, the appropriate control is used to input a passenger charge based on the flat rate. This may include use of a keypad on the taximeter or a button that has been programmed to offer a selection representing a particular flat rate. When this input is made, the display on the taximeter changes from a zero fare to the monetary amount associated with that particular flat rate. Some may view this change as an advancement of indications. The USNWG, in its revision of the proposal, added a new "Note" to paragraph S.1.2. Advancement of Indicating Elements, which is intended to address this scenario.

The USNWG on Taximeters also agreed to recommend an additional change to paragraph S.1.2. Advancement of Indicating Elements in Item 354-1 based on a report to that group by one of its members. It was reported that an NTEP evaluator was able to restart the advancement of passenger charges on a taximeter system following the generation of a printed receipt without having to first clear the transaction. In considering this issue, the USNWG agreed that the generation of a passenger receipt by a taximeter system should result in the system concluding that transaction and that any subsequent transaction should not begin until the taximeter has been cleared. The USNWG agreed to propose adding a new sentence to the paragraph clarifying that no advancement of charges is permitted beyond the conclusion of a transaction (which may include a receipt being issued).

Mr. Barton provided a handout of the proposal to the Committee (as revised by the USNWG on Taximeters) and noted that the USNWG is recommending it as a Voting item in 2016 along with the other three items in this group.

Dr. Matthew Curran (Florida) asked Mr. Barton if the USNWG had considered the changes proposed by the SWMA at its 2015 Annual Meeting. Mr. Barton indicated that the USNWG had not convened since the SWMA meeting and, therefore, members had not yet had the opportunity to consider those changes.

Ms. Jo Rausen (New York City Taxi and Limousine Commission) indicated that she supported all of the taximeter items.

During its work session, the Committee discussed the need to amend the Application Section of the Taximeters Code to make clear that the code is not intended to apply to entities that only charge a flat rate or negotiated rate (e.g., some hotel shuttles, etc.) as was proposed by the SWMA during its 2015 Annual Meeting for agenda Items 354-1 and 354-4. One member of the Committee indicated that the changes proposed in Items 354-1 and 354-4 could lead some officials to believe that a shuttle van, for example, would be required to have a taximeter installed even if all charges to customers were by a flat or negotiated rate. It was for this reason that the SWMA had recommended paragraph A.2. Exceptions be amended to include entities that only charge a flat or negotiated rate and the amended paragraph then added to the proposals under these two agenda items. Although some Committee members didn't believe it was necessary to amend the Application Section to include such an exception, everyone agreed there would be no harm in doing so since such a change would only make the application of the code clearer. Thus, the Committee agreed to amend the proposals in agenda Items 354-1 and 354-4 to include paragraph A.2. of the Code with the suggested changes proposed by the SWMA included as shown in Item Under Consideration for these two agenda items. The Committee also agreed to revise the proposal under agenda Item 354-1 as recommended by the USNWG and as shown in the Item Under Consideration and agreed to present all four items for Vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped together agenda Items 354-1 through 354-4 and comments were taken for all four items simultaneously. Mr. John Barton (NIST, OWM), chairman of the USNWG on taximeters, spoke first and indicated that the USNWG on taximeters supports all four items (agenda Items 354-1 through 354-4).

Mr. Barton stated that the USNWG does not see the need to add an exemption to the Application Section of the Taximeters Code as proposed in agenda Items 354-1 and 354-4 and voiced concern regarding use of the word "rate" in the proposed exemption language.

A representative from Florida noted that the exemption language referenced by Mr. Barton was in fact necessary to clarify the code did not apply to services in which customers are charged solely by flat fee or a fixed negotiated fee. Concern was expressed that without this clarification those businesses may inadvertently be brought into this regulation. Further, the representative stated that since the USNWG clarified the intent was not to bring these businesses into this regulation, it would only be prudent to clarify that intent and avoid unintended consequences down the road. The representative also noted that he had no objection to changing the wording in the exemption proposed.

With respect to the "Note" proposed for addition in paragraph S.1.2. of agenda Item 354-1, Mr. Barton stated that the proposed addition of an explanatory "note" clarifies that the input of a fixed, non-incrementing fare may be considered as an advancement of indications by some, but when flat or negotiated rates are used, the initial charge entered is not permitted to advance further. He recommended that this paragraph delete the designation of "note" and be reformatted simply as a supporting paragraph in the requirement.

Mr. Barton also stated that he interpreted the intent of the addition of the second paragraph in Item 354-1 to prohibit the advancement of customer charges following the conclusion of a transaction and until that transaction has been cleared from the taximeter. The rationale for this proposed change was provided by an NTEP evaluator who reported to the USNWG on an experience that occurred during a type evaluation of a taximeter system. During that evaluation, the accrual of indicated charges was momentarily stopped by the evaluator and a receipt containing the totalized charges was issued. Following the printing of the receipt, the evaluator was able to continue to add to the totalized customer charges by advancing the taximeter register without clearing the previous transaction. Mr. Barton recommended adding the statement "after payment is settled" within the parentheses in the second paragraph of the proposal to help convey that the transaction has indeed been concluded. Further, Mr. Barton stated he considers a transaction to be ended once the actions described in the second paragraph of the proposal have been performed. Provided that these actions have been performed, it should not be necessary to activate any further controls on a device to bring the current transaction to an end. Advancement of the indicating elements would then be permitted to occur following the taximeter being cleared as is stated in the proposal. Mr. Barton stated that he believed that taximeters not equipped with a recording element should not be affected by the proposed changes considering that only taximeters manufactured and placed into service on or after to January 1, 2016, are required to be equipped with a recording element. Considering that only taximeters manufactured and placed into service as of January 1, 2016, are required to be equipped with a recording element (in accordance with paragraph S.1.1.1. Recording Elements in NIST, Handbook 44, Section 5.54.), he recommended this portion/paragraph of the proposal should be made nonretroactive and enforceable as of January 1, 2017.

Mr. Ross Andersen (New York, Retired) stated that he agreed with the representative from Florida's comments concerning the exemption proposed in agenda Items 354-1 and 354-4. Mr. Andersen, speaking to agenda Item 354-1, asked the question "How does the taximeter know when the button was pushed the last time (to total the transaction)?" He noted that that the printed ticket has to be available as soon as the taxi was hired so, "How does it know this?" Mr. Andersen added that when using a credit card swiping device, "How does the taxi meter know if a credit card has been swiped?" He concluded by stating that he believed a new sentence should be added reading, "A taximeter transaction shall begin when the taximeter is hired and shall end when the taximeter is cleared. Advancement of the fare indication, or entry of extras or other charges, shall only occur when the taximeter is hired. A taximeter shall be cleared by a specific action by the operator, such as activating a manual control, issuing a receipt, or completing the processing of payment through the taximeter using credit cards, debit cards, etc., which may or may not include issuing a receipt."

In response to Mr. Andersen's questions, Mr. Barton stated that he believed the language being proposed clarified when the transaction had been concluded so the question had been addressed. Mr. Andersen followed up by stating that the receipt is not actually issued until someone presses the 'print' button and concluded by noting that 'available' is not the same as "issued." Mr. Barton concluded by stating that all agenda items in the group are related requirements for the Taximeter Code and that the USNWG on Taximeters recommended these items be considered as Voting items in a single Vote.

Regarding Item 354-2, Mr. Barton stated that he understands that the use of more than one rate in the calculation of a single fare is an established industry practice that is and has been permitted in some jurisdictions. NIST, OWM believes that to mitigate the possible fraudulent use of this capability and to contribute to the transparency of a transaction where this may occur, the proposed change is appropriate. He further stated that he believed by limiting the ability to change the rate in use to only after the completion of an interval or money drop within a trip, the calculation of the resulting fare is more easily verified. If the rate was permitted to change in the middle of an interval, the calculation of that portion of the fare for the interval where multiple rates would be used would be significantly more complex. Mr. Barton concluded by stating, as with the Item 354-1, he recommends that the statement proposed to be added should not appear as a "note" but instead appear as a stand-alone paragraph in the requirement.

Regarding Item 354-3, Mr. Barton acknowledged the reports from the USNWG regarding the lack of any sources declaring a need for a requirement addressing this type of mechanism. He stated he is unaware of any evidence that would indicate a need for retaining this requirement. The requirement and associated definition pertaining to a lever arm and flag does not appear to be relevant to the technologies currently used in taximeters.

Regarding Item 354-4, Mr. Barton stated he understands that when a "negotiated rate" is applied as a passenger charge, this will also result in a non-incrementing monetary amount for this charge. Mr. Barton recommended the proposed definition for "negotiated rate" be revised as follows to more closely mirror the proposed definition for "flat rate:"

negotiated rate. – a rate selection that when applied results in a fixed (non-incrementing) amount for passenger charges based on a value that has been agreed upon by the operator and passenger. ~~The amount set by a negotiated rate does not increment.~~ [5.54]

(Added 201X)

In consideration of the comments received on this agenda item (agenda Item 354-1), the Committee agreed to complete the following three changes to the proposal:

1. Amend the language in proposed sub-paragraph A.2.(b) to state that it applies to devices rather than entities;
2. Amend the second sentence of paragraph S.1.2. from "retroactive" to "non-retroactive and specify an effective date of January 1, 2017;"
3. Strike the "Note" designation appearing in advance of the last sentence of paragraph S.1.2.

The Committee then agreed to present the item, as shown in the Item Under Consideration, for Vote.

Regional Association Comments:
The WWMA S&T Committee did not receive comments on this item during its open hearings at the 2015 WWMA Annual Meeting. The WWMA believes that this item is fully developed and recommends that it be a Voting item.

The CWMA reported during its 2015 Interim Meeting that it would like the submitter to consider clarifying whether a receipt must be issued once the transaction is completed. The CWMA recommended that it be a Voting item at both its 2015 Interim and 2016 Annual Meetings.

NEWMA indicated at its 2015 Interim Meeting, the note in the proposed language should be removed. The remainder of the item has merit, and NEWMA recommends that it be a Voting item. At its 2016 Annual Meeting, NEWMA questioned how the proposed language, "At the conclusion...cleared." would apply to taximeters that are not equipped with ticket printers and that consideration be given to making this portion of the proposal a user requirement since it is the user that ultimately clears the transaction and not the design of the device. NEWMA reported it feels the language being proposed significantly changes that which was originally proposed and that the intent of these changes is not clear. Given the comments received on this item, NEWMA recommended the status of this item be changed from Voting to Information.

The SWMA grouped this item in a batch consisting of Items 354-1, 354-2, 354-3, and 354-4 and all items were heard together. The SWMA had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but thinks changes to Section A.2. would make it clear such entities are not subject to the requirements of this code. The SWMA proposed the following changes to Section A.2. and recommended that these items be Voting items:

A.2. Exceptions. – This code does not apply to:

(a) **Odometers** ~~**odometers**~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) Entities that only charge a flat rate or negotiated rate.

(Amended 1977 **and 201X)**

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

354-2 V S.2. Basis of Fare Calculations

(This item was Adopted.)

Source:
U.S. National Working Group on Taximeters (2016)

Purpose:
To provide a clear statement that more than one rate may be used to calculate a single fare; this proposal would add language to the existing S.2. Basis of Fare Calculations. The proposed changes also specify the only time during the sequence of fare calculations at which a change in the rate applied would be permitted to occur.

Item under Consideration:
Amend NIST Handbook 44, Taximeters Code as follows:

S.2. Basis of Fare Calculations. – A taximeter shall calculate fares only upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

A taximeter may utilize more than one rate to calculate the fare during a trip. Any change in the applied rate must occur at the completion of the current interval.

(Amended 1977 **and 2016)**

Background/Discussion:
In some jurisdictions, it is a permitted practice to apply more than one rate in the calculation of passenger fare during a single trip. While there is no language in the Taximeters Code preventing this at this time, there is no language that would expressly permit this practice. Because it has been reported by some regulatory officials that there is a question about whether the use of multiple rates for the calculation of a single fare should be permitted, the additional language suggested in this proposal will explicitly state that this practice is permissible. It is also necessary to ensure that any change in the rate applied in the calculation of a single fare be as clearly observable to the passenger as possible. Therefore, it is important that no change to the rate being applied to calculate a fare would occur in the middle of a "money drop" or interval. If that were to occur, the monetary value of that particular interval during the trip would involve a complex series of calculations that would be very difficult to analyze. This is believed to be a potential cause for confusion and misunderstanding by the average passenger or operator.

2016 NCWM Interim Meeting:
At its 2016 NCWM Interim Meeting open hearings, the Committee agreed to group together agenda Items 354-1, 354-2, 354-3, and 354-4 and take comments simultaneously on these items. See agenda Item 354-1 for a summary of the comments received and the actions taken by the Committee on these four items.

2016 NCWM Annual Meeting:
At its 2016 NCWM Annual Meeting open hearings, the Committee grouped Items 354-1 through 354-4 together and took comments on all four items simultaneously. See Item 354-1 for a summary of the comments that the Committee received on these four items. In consideration of the comments received on this particular agenda item, the Committee agreed to delete the "Note" designation from the proposal as follows and present the item, as shown in Item Under Consideration, for Vote:

~~**Note:**~~ **A taximeter may utilize more than one rate to calculate the fare during a trip. Any change in the applied rate must occur at the completion of the current interval.**

Regional Association Comments:
The WWMA did not receive comments on this item during the open hearings of the 2015 WWMA Annual Meeting. During its Committee discussions, the WWMA S&T Committee noted that there is a need for verification of time of day, as rate changes may be associated with specific hours of the day. The WWMA forwarded the item to the NCWM and recommended that it be a Developing item.

At its 2015 Interim Meeting, the CWMA reported it believes this item needs further development; specifically, whether the way the fare can be calculated can change throughout the period of travel and if that is clear to the customer. The CWMA forwarded the item to the NCWM and recommended that it be a Developing item. At its 2016 Annual Meeting, NEWMA reported it believes the item is fully developed and recommended it be forwarded as a Voting item.

NEWMA requested, at its 2015 Interim Meeting, assurance that the wording of this item conveys the correct meeting of verification of fare calculations before it be granted Information or Voting status. NEWMA forwarded it to the NCWM and recommended it be a Developing item. NEWMA grouped agenda Items 354-2, 354-3, and 354-4 together at its 2016 Annual Meeting and reported it feels these items are developed and ready for a Vote.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 354-1, 354-2, 354-3, and 354-4 and all items were heard together. The SWMA forwarded this item to NCWM and recommended that it be a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

354-3 V S.3.2. Flag

(This item was Adopted.)

Source:
U.S. National Working Group on Taximeters (2016)

Purpose:
Eliminate unnecessary and archaic language from the NIST Handbook 44, Taximeters Code.

Item Under Consideration:
Delete NIST Handbook 44, Taximeters Code paragraph S.3.2. Flag and the definition of the word "Flag" in Appendix D of NIST Handbook 44 as follows:

NIST Handbook 44, Taximeters Code paragraph S.3.2. Flag:

~~**S.3.2. Flag. If the control for the operating condition is a lever arm and flag, the flag shall be at its highest position when the taximeter is cleared, and in this position the whole of the flag shall be above the level of the taximeter housing.**~~

NIST Handbook 44, Appendix D, definition:

~~**flag. – A plate at the end of the lever arm or similar part by which the operating condition of a taximeter is controlled and indicated. [5.54]**~~

Background/Discussion:
The language describing the operation of taximeters in this existing paragraph refers to specific mechanisms in older, obsolete models of taximeters such as a "flag" and "lever arm." Based on information gathered through the USNWG, personal accounts, and the fact that there are no NTEP Certificates of Conformance found (active or inactive) for

mechanical-type taximeters, the USNWG has surmised that the taxi industry relies exclusively on electronic-type meters today and that there is no need for a requirement that specifically addresses these mechanical-based meters that are no longer being used in commercial service.

The reference to the mechanical components in S.3.2. has no relevance to the electronic meters currently used and, therefore, it is believed this requirement is no longer needed for the examination of today's taximeters.

The formation of the USNWG on Taximeters was performed through an exhaustive process where any and all stakeholders were identified. All efforts were made to establish contact with those stakeholders. Those identified included device manufacturers, regulatory officials, subject matter experts, and trade associations. Agendas and meeting summaries that included details concerning this proposal were made available to all stakeholders. Throughout the three years of deliberations of the USNWG, there has been no reported use of mechanical-type taximeters. To this date, there has been no information provided to the USNWG that would indicate the existence of in-service mechanical-based taximeters.

2016 NCWM Interim Meeting:
At its 2016 NCWM Interim Meeting open hearings, the Committee agreed to group together agenda Items 354-1, 354-2, 354-3, and 354-4 and take comments simultaneously on these items. See agenda Item 354-1 for a summary of the comments received and the actions taken by the Committee on these four items.

2016 NCWM Annual Meeting:
At its 2016 NCWM Annual Meeting open hearings, the Committee grouped agenda Items 354-1 through 354-4 together and took comments on all four items simultaneously. See Item 354-1 for a summary of the comments the Committee received on these four items. In consideration of the comments received on this particular agenda item, the Committee agreed to present the item for Vote with no changes.

Regional Association Comments:
During the open hearings at its 2015 Annual Meeting, the WWMA did not receive comments on this item. The WWMA S&T Committee agrees with the recommendation from the USNWG on Taximeters and noted that "flag" is still defined in Appendix D and recommends striking that definition when S.3.2. is removed from NIST Handbook 44. The WWMA forwarded the item to the NCWM and recommended that it be a Voting item with the following additional amendment to NIST Handbook 44 Appendix D, Definitions:

> ~~**flag. A plate at the end of the lever arm or similar part by which the operating condition of a taximeter is controlled and indicated. [5.54]**~~

The CWMA agrees with the submitter that this Section is outdated and can be removed along with the definition of "flag" in Appendix D. The CWMA forwarded the item to NCWM and recommended that it be a Voting item at both its 2015 Interim and 2016 Annual Meetings.

At its 2015 Interim Meeting, NEWMA commented that this item has merit and forwarded it to the NCWM, recommending it as a Voting item. NEWMA grouped agenda Items 354-2, 354-3, and 354-4 together at its 2016 Annual Meeting and reported it feels these items are developed and ready for a Vote.

At its fall 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 354-1, 354-2, 354-3, and 354-4 and all items were heard together. The SWMA forwarded this item to the NCWM and recommended that it be a Voting item and that the definition for "flag" be removed from NIST Handbook 44, Appendix D as shown above in the WWMA report.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

354-4 V Appendix D - Definitions: Flat Rate and Negotiated Rate

(This item was Adopted.)

Source:
U.S. National Working Group on Taximeters (2016)

Purpose:
Provide definitions for two terms introduced in a proposed amendment to S.1.2. Advancement of Indicating Elements in the NIST Handbook 44, Taximeters Code.

Item under Consideration:
Amend NIST Handbook 44, Taximeters Code paragraph A.2. Exceptions and add new definitions for "flat rate" and "negotiated rate" to NIST Handbook 44, Appendix D - Definitions as follows:

Amend NIST Handbook 44, Taximeters Code paragraph A.2. Exceptions as follows:

A.2. Exceptions. – This code does not apply to:

(a) **Odometers** ~~**odometers**~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) **Devices that only display a flat rate or negotiated rate.**

(Amended 1977 **and 2016**)

Add the following definitions to NIST Handbook 44, Appendix D:

flat rate. – a rate selection that when applied results in the indication of a fixed (non-incrementing) amount for passenger charges. This rate shall be included on the statement of established rates that is required to be posted in the vehicle. [5.54]

(Added 2016)

negotiated rate. – a rate selection that when applied results in a fixed (non-incrementing) amount for passenger charges and is based on a value that has been agreed upon by the operator and passenger. [5.54]

(Added 2016)

Background/Discussion:
While not appearing in the current edition of NIST Handbook 44, the terms "flat rate" and "negotiated rate" are used in another proposal to amend the existing requirement S.1.2. Advancement of Indicating Elements. The proposal to amend S.1.2. is also being submitted to the four regional weights and measures associations for consideration and includes the use of the two terms that are defined under this proposal. Both terms have specific meaning when used in the context of NIST Handbook 44, Taximeters Code and, therefore, it is believed to be beneficial to provide the definition for both terms in NIST Handbook 44, Appendix D to provide a clear understanding of the terms and the requirement that they would be used in.

2016 NCWM Interim Meeting:
At its 2016 NCWM Interim Meeting open hearings, the Committee agreed to group together agenda Items 354-1, 354-2, 354-3, and 354-4 and take comments simultaneously on these items. See agenda Item 354-1 for a summary of the comments received and the actions taken by the Committee on these four items.

2016 NCWM Annual Meeting:
At its 2016 NCWM Annual Meeting open hearings, the Committee grouped agenda Items 354-1 through 354-4 together and took comments on all four items simultaneously. See Item 354-1 for a summary of the comments that the Committee received on these four items. In consideration of the comments received on this particular agenda item, the Committee agreed to make the following two changes to the proposal:

1. Amend the language in proposed sub-paragraph A.2.(b) to state that it applies to devices rather than entities.

2. Amend the proposed definition of "negotiated rate" so that it more closely mirrors the definition of "flat rate."

The Committee then agreed to present the item, as shown in Item Under Consideration, for Vote.

Regional Association Comments:
The WWMA did not receive comments on this item during the open hearings of the 2015 WWMA Annual Meeting. The WWMA S&T Committee agrees with the recommendation from the USNWG on Taximeters. The WWMA forwarded the item to the NCWM and recommended that it be a Voting item.

The CWMA recognizes the need for the definitions and believes this item is sufficiently developed. The CWMA forwarded the item to the NCWM and recommended that it be a Voting item at both its 2015 Interim Meeting and 2016 Annual Meeting.

NEWMA found merit in the item but recommended that it be amended as shown below. NEWMA forwarded it to the NCWM, recommending the amended version be designated a Voting item.

flat rate. – a rate selection that when applied results in the indication of a fixed (non-incrementing) amount for passenger charges. ~~This rate shall be included on the statement of established rates that is required to be posted in the vehicle~~ The amount set by a flat rate does not increment.
(Added 201X)

negotiated rate. – a rate selection that when applied results in passenger charges based on a value that has been agreed upon by the operator and passenger. The amount set by a negotiated rate does not increment.
(Added 201X)

NEWMA grouped agenda Items 354-2, 354-3, and 354-4 together at its 2016 Annual Meeting and reported it feels these items are developed and ready for a Vote.

At its 2015 Annual Meeting, the SWMA grouped this item in a batch consisting of Items 354-1, 354-2, 354-3, and 354-4 and all items were heard together. The Committee had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but thinks changes to Section A.2. would make it clear such entities are not subject to the requirements of this code. The SWMA proposed the following changes to Section A.2. and recommended that these items be Voting items:

A.2. Exceptions. – This code does not apply to:

(a) **Odometers** ~~**odometers**~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) **Entities that only charge a flat rate or negotiated rate.**

(Amended 1977 **and 201X)**

354-5 D USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System-Based Systems for Time and Distance Measurement

Note: This item was originally titled "Item 360-5, S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda. At the 2013 NCWM Interim Meeting, the Committee combined that item with "Item 354-1. Global Positioning Systems for Taximeters" and "Item 360-6. Global Positioning Systems for Taximeters" to create this new, consolidated item to address the development of recommendations on multiple topics related to taximeters and GPS-based time and distance measuring systems.

Source:
NIST USNWG on Taximeters

Purpose:
Develop recommendations for modifying the existing Taximeters Code to reflect current technology (including requirements for sealing, display requirements, and other features) and to examine GPS-based time and distance measuring systems to determine how to best address these measuring systems in NIST Handbook 44 to ensure accuracy and transparency for passengers and businesses.

Item under Consideration:
This item is under development. Comments and inquiries may be directed to Mr. John Barton (NIST OWM) at (301) 975-4002 or **john.barton@nist.gov**.

The USNWG is considering proposals to modify the sealing requirements in the Taximeters Code to reflect more advanced sealing methods (see 2012 NCWM Final S&T Report); to amend the Taximeters Code to specifically recognize GPS-based time and distance measuring systems; and to amend other sections of the Taximeters Code to reflect current technology and business practices while ensuring accuracy and transparency for customers and a level playing field for transportation service companies.

Background/Discussion:
The Committee has received multiple proposals over the past several years related to updating the current NIST Handbook 44, Taximeters Code to reflect current technology as well as a request to establish criteria for GPS-based time and distance measuring systems. In April 2012, NIST OWM established a U.S. National Working Group to work on these issues. The USNWG has met multiple times since it was established. For details of those meetings as well as the current proposals being developed by the USNWG, please contact Mr. Barton as noted in the "Item Under Consideration" above.

Additional background information and updates on the progress associated with this item can be found in the Committee's 2015 (see NIST SP 1210 [2015]) and earlier final reports.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Mr. John Barton (OWM, NIST Technical Advisor to the USNWG on Taximeters) reported that the USNWG on Taximeters recommended that agenda Item 354-5 and 354-6 be consolidated into a single agenda item. The purpose of the item is to update NIST Handbook 44 requirements to reflect current technology and to address GPS based systems. Ms. Kristin Macey (California) stated that she objected to the consolidation. The Committee agreed to maintain the two as separate items on its agenda and maintain the Developing status of both.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Mr. John Barton, Chair of the USNWG on Taximeters, stated a meeting of the USNWG on Taximeters was held just prior to the 2016 NCWM Annual Meeting at which time it reviewed the Transportation Network Systems (TNS) Draft Code as well as associated changes. The USNWG plans to draft and submit proposals to amend the TNS Draft Code for consideration by the four regional weights and measures associations at the fall 2016.

Regional Associations Meetings:
The WWMA did not receive comments on this item during open hearings at its fall 2015 Annual Meeting. The WWMA agrees with the USNWG on Taximeters that this item remain Developing. The WWMA encourages the USNWG on Taximeters to give consideration to other applications involving services, including those covered by the Odometers Code such as towing, ambulances, deliveries, etc.

The CWMA believes this item has merit, but needs further development. It recommended that this item be forwarded to the NCWM as a Developing item during both its 2015 Interim Meeting and 2016 Annual Meeting.

NEWMA agreed with a suggestion from a member of the USNWG on Taximeters during the 2015 NEWMA Interim Meeting that this item remain as a Developing item. At its 2016 Annual Meeting, NEWMA reported it feels the USNWG on Taximeters is very close to modifying the Taximeters Code to reflect current technology to suit the GPS-based systems and recommended to the NCWM that it remain a Developing item.

At its fall 2015 Annual Meeting, the SWMA encouraged the USNWG on Taximeters to continue to develop the GPS specifications and tolerances and recommended that this item remain as a Developing item.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

354-6 W Transportation Network Systems – Draft Code

(This item was Withdrawn.)

Source:
California Department of Food and Agriculture, Division of Measurement Standards (2016)

Purpose:
Create an Information item to engage the weights and measures community in a discussion to create a code section within NIST Handbook 44 for transportation measuring devices that determine fares using GPS to calculate time and distance.

Item under Consideration:
Amend the NIST Handbook 44, Taximeters Code as follows:

- Rename Section 5.54. Taximeters to Transportation Measuring Devices;
- Within Section 5.54., create Section 5.54.(a) for Taximeters and Section 5.54.(b) for Transportation Network Systems;
- Move current requirements in Section 5.54. Taximeters to Section 5.54(a). Taximeters; and
- Add draft requirements for Transportation Network Systems to new Section 5.54.(b) as follows:

Transportation Network Systems – Tentative Code

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. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

(Tentative Code Added 20XX)

A. Application

A.1. General. – This code applies to systems that utilize Global Positioning System (GPS) software and associated equipment or other comparable software-based system to determine distance and time, separately or simultaneously, to calculate a rate or rates and indicate the charge for hire of a vehicle or other mode of transport.

A.2. Exceptions. – This code does not apply to taximeters that use distance measurement transducer or odometers on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

A.3. Additional Code Requirements. – In addition to the requirements of this code, Transportation Network Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements.

S.1.1. General. – A system shall be equipped with a primary indicating element and may be equipped with a recording element.

S.1.1.1. Recording Elements. – A receipt providing information as required in S.1.9. Recorded Representations shall be available from the system or other means through an integral or separate recording element for all transactions conducted.

S.1.2. Identification. – The system 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) the current software version or revision identifier shall be:

(a) **prefaced by words or an abbreviation that clearly identifies the number as the required version or revision.**

i. Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number";

ii. 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.);

(b) **directly linked to the software itself.**

(c) a California Type Evaluation Program (CTEP) Certificate of Approval (COA) number or a corresponding COA Addendum Number. The COA Number or a corresponding COA Addendum Number shall be prefaced by the terms "CTEP COA," "COA," 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.).

(d) If the system is it designed such that it consists of more than one part, the part dedicated to the metrologically significant software shall be clearly identified.

S.1.3. Location of Marking Information. – The required information in S.1.2. Identification. shall be:

(a) continuously displayed; or

(b) 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," "Weights and Measures Identification," or "Identification."

Note: Clear instructions for accessing the location of the information required in S.1.2. Identification. shall be listed on the CTEP COA, including information necessary to identify that the software is the same type that was evaluated.

S.1.4. Advancement of Indicating Elements. – Except when a system is being reset, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or the time mechanism.

S.1.5. Visibility of Indications. – The indication of fare shall be available at the beginning of the transaction. All fares shall be available whenever the vehicle is hired and in operation. All indications of passenger interest shall be displayed to the passenger, either in the vehicle from a distance of 1.2 m (4 ft) under any condition of normal operation, or on a device operated by the passenger. If the display is not on continuously, it shall be accumulated continuously so that real-time measurement is displayed during activation, no more than every 60 seconds.
(Nonretroactive as of 20XX)

S.1.5.1. Minimum Height of Figures, Words, and Symbols. – If the indications are displayed in the vehicle, the minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

S.1.5.2. Lighting of Indications. – If the indications are displayed in the vehicle, integral lighting shall be provided to illuminate the fare and extras.

S.1.5.3. Supplemental Indications. – If a supplementary indicating element is installed in a vehicle to provide information regarding the service to the passenger, it shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display unless disabled by the passenger at all times during the transaction.

S.1.5.3.1. Fare and extras charges – The indication of fare and extras charges on the indicating element shall agree with similar indications displayed on all other indicating elements in the system.

S.1.6. Actuation of Fare-Indicating System. – A system shall be designed to calculate fares upon the basis of a combination of distance traveled and time elapsed.

S.1.7. Operating Condition.

S.1.7.1. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.7.2. Extras. – Extras shall be indicated as a separate item and shall not be included in the fare indication. They shall be identified by the word "Extras" or by an equivalent expression. Values shall be defined by suitable words or monetary signs. Means may be provided to totalize the fare and extras if the totalized amount returns to separate indications of fare and extras within 5 seconds or less.

S.1.7.2.1. Nonuse of Extras. – If and when system extras are prohibited by a legal authority or are discontinued by a vehicle operator, the extras mechanisms shall be rendered inoperable or the extras indications shall be effectively obscured by permanent means.

S.1.8. Protection of Indications. – All indications of fare and extras shall be protected from unauthorized alteration or manipulation.

S.1.9. Recorded Representation. – A receipt issued from a system, whether through an integral or separate recording element, shall include the following:

(a) date;

(b) unique vehicle identification number, or other identifying information as specified by the statutory authority;

(c) start and end time of trip, and total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the associated fare in $ at each rate;

(f) additional charges where permitted such as extras; and

(g) total fare in $ (total charge).

S.2. Basis of Fare Calculations. – A system may calculate fares upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

S.3. Interference. – For systems that determine distance and time separately there shall be no interference between the time and the distance portions of the mechanism device at any speed of operation.

S.4. Provision for Sealing.

S.4.1. System Security. – A system shall be designed with provisions to ensure that no change can be made that detrimentally affects its metrological integrity.

S.4.2. Changelog. – The system shall provide a changelog, with the information available electronically to the weights and measures official. The changelog shall include a chronological record of all changes affecting the metrological integrity of the system.

S.4.3. Software Authenticity. – Technical means shall be employed to guarantee the authenticity of the loaded software, to ensure that it originates from the owner of the type approval certificate.

S.5. Provisions for Power Loss.

S.5.1. Transaction Information. – In the event of a power loss, the system shall be capable of determining the information needed to complete any transaction in progress at the time of the power loss.

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, a distance test of a system shall be conducted utilizing a distance test or a transfer standard test where applicable.

(a) Specific Distance Test. – The test consists of operating the conveyance over a precisely measured course at least one mile in length.

(b) Transfer Standard Test. – When comparing a system with a calibrated transfer standard, the distance shall be equal to at least the distance traveled on the specific distance test.

N.1.2. Test Procedures. – Not less than two test runs shall be conducted for a distance test and shall be at a speed approximating the average speed traveled by the vehicle in normal service.

N.1.3. Test Conditions. – Tests shall be conducted under conditions that are usual and customary with respect to the location and use of the device.

N.2. Time Test. – A system equipped with a timing device shall be tested during the specific distance and transfer standard tests.

N.3. Isolation Test. – If a system is designed to calculate fares for time and distance separately, tests for time and distance shall be conducted independently.

N.4. Software Tests. – The system software shall be loaded onto a smartphone and tested for authenticity and version number.

T. Tolerances

T.1. Tolerance Values.

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) on Overregistration: 1 %; and

(b) on Underregistration: 4 %

T.1.2. Time Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) on Overregistration: 5 seconds per test; and

(b) on Underregistration: 5 seconds per test.

Background/Discussion:
Transportation Network Companies (TNCs) (e.g., Uber, Lyft, and possibly others) have developed software applications for use with a mobile device, which enables their drivers to provide transportation services for hire to customers who also have TNC applications downloaded on their mobile device. The software has significant metrological importance and is essential to these commercial transactions. Fares are determined based on a GPS calculating distance and time.

There are unique operating characteristics of these software-based systems that distinguish them from traditional mechanical and electronic taximeters. For this reason, a separate code section is appropriate.

Weights and measures jurisdictions throughout the United States are coming under increasing pressure to demonstrate equal application of weights and measures laws to companies offering alternative transportation services to the traditional taxicab business model.

Taximeter manufacturers may soon decide to use GPS technology to calculate time and distance in an effort to be more like the TNC business model, which has gained widespread public acceptance.

In the United States, Uber operates in 43 states and Washington, D.C., and Lyft operates in 27 states and Washington, D.C. Both these and other similar companies are growing and expanding their market share.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, a number officials and industry representatives alike supported the continued development of this item. Representatives from Lyft, Inc. and Uber Technologies, Inc. further recommended the item remain under California direction.

Mr. Doug Musick (Kansas) commented that he, too, supported maintaining the Developing status of the item. He recommended that that the scope be broadened to include agricultural applications noting that GPS-based technology is huge for measuring area in crop applications. He suggested that all possible uses of the technology be considered and evaluated.

In consideration of the comments received, the Committee agreed to recommend maintaining the Developing status of this item.

2016 NCWM Annual Meeting:
During the Committee's open hearings at the 2016 NCWM Annual Meeting, Ms. Kristin Macey (California), submitter of the item, made a recommendation to merge this item with Item 354-5 and let the USNWG on Taximeters develop the draft code. She added that the code being proposed by this agenda item is "California specific" and concluded by stating that California may come back with another proposal depending on the direction and progress of the USNWG, but would prefer that a single proposal come forward. The Committee agreed to Withdraw this item based on Ms. Macey's recommendation to merge the item together with Item 354-5.

Regional Association Comments:
During its fall 2015 Annual Meeting open hearings, the WWMA did not receive comments on this item. The WWMA S&T Committee agrees with the submitter that this item should be accepted by the NCWM as a tentative code. The WWMA S&T Committee recommends that the USNWG on Taximeters look at this tentative code as they continue their work. Consideration may be given to other applications involving charges for services as found in the Odometers Code. The WWMA forwarded the item to NCWM and recommended it as a Voting item with some changes as shown here:

Transportation Network Systems – Tentative Code

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. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

(Tentative Code Added 20XX)

A. Application

A.1. General. – This code applies to systems that utilize Global Positioning System (GPS), software and associated equipment or other comparable software-based system to determine distance and time, separately or simultaneously, to calculate a rate or rates and indicate the charge for hire of a vehicle or other mode of transport.

A.2. Exceptions. – This code does not apply to taximeters that use distance measurement transducer or odometers on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

A.3. Additional Code Requirements. – In addition to the requirements of this code, Transportation Network Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements.

S.1.1. General. – A system shall be equipped with a primary indicating element and may be equipped with a recording element.

S.1.1.1. Recording Elements. – A receipt providing information as required in S.1.9. Recorded Representations shall be available from the system or other means through an integral or separate recording element for all transactions conducted.

S.1.2. Identification. – The system 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) the current software version or revision identifier shall be:

(1) prefaced by words or an abbreviation that clearly identifies the number as the required version or revision.

(2) abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number";

(3) 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.).

(c) directly linked to the software itself;

(d) a ~~California~~ Type Evaluation Program ~~(CTEP)~~ Certificate of Approval (COA) number or a corresponding COA Addendum Number. The COA Number or a corresponding COA Addendum Number shall be prefaced by the terms ~~"CTEP COA,"~~ "COA," 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.); and

(e) if the system is it designed such that it consists of more than one part, the part dedicated to the metrologically significant software shall be clearly identified.

S.1.3. Location of Marking Information. – The required information in S.1.2. Identification. shall be:

(a) continuously displayed; or

(b) 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," "Weights and Measures Identification," or "Identification."

Note: Clear instructions for accessing the location of the information required in S.1.2. Identification. shall be listed on the ~~CTEP~~ COA, including information necessary to identify that the software is the same type that was evaluated.

S.1.4. Advancement of Indicating Elements. – Except when a system is being reset, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or the time mechanism.

S.1.5. Visibility of Indications. – The indication of fare shall be available at the beginning of the transaction. All fares shall be available whenever the vehicle is hired and in operation. All indications of passenger interest shall be displayed to the passenger, either in the vehicle from a distance of 1.2 m (4 ft) under any condition of normal operation, or on a device operated by the passenger. If the display is not on continuously, it shall be accumulated continuously so that real-time measurement is displayed during activation, no more than every 60 seconds.
[Nonretroactive as of 20XX]

S.1.5.1. Minimum Height of Figures, Words, and Symbols. – If the indications are displayed in the vehicle, the minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

S.1.5.2. Lighting of Indications. – If the indications are displayed in the vehicle, integral lighting shall be provided to illuminate the fare and extras.

S.1.5.3. Supplemental Indications. – If a supplementary indicating element is installed in a vehicle to provide information regarding the service to the passenger, it shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display unless disabled by the passenger at all times during the transaction.

S.1.5.3.1. Fare and extras charges – The indication of fare and extras charges on the indicating element shall agree with similar indications displayed on all other indicating elements in the system.

S.1.6. Actuation of Fare-Indicating System. – A system shall be designed to calculate fares upon the basis of a combination of distance traveled and time elapsed.

S.1.7. Operating Condition.

S.1.7.1. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.7.2. Extras. – Extras shall be indicated as a separate item and shall not be included in the fare indication. They shall be identified by the word "Extras" or by an equivalent expression. Values shall be defined by suitable words or monetary signs. Means may be provided to totalize the fare and extras if the totalized amount returns to separate indications of fare and extras within 5 seconds or less.

S.1.7.2.1. Nonuse of Extras. – If and when system extras are prohibited by a legal authority or are discontinued by a vehicle operator, the extras mechanisms shall be rendered inoperable or the extras indications shall be effectively obscured by permanent means.

S.1.8. Protection of Indications. – All indications of fare and extras shall be protected from unauthorized alteration or manipulation.

S.1.9. Recorded Representation. – A receipt issued from a system, whether through an integral or separate recording element, shall include the following:

(a) date;

(b) unique vehicle identification number, or other identifying information as specified by the statutory authority;

(c) start and end time of trip, and total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the associated fare in $ at each rate;

(f) additional charges where permitted such as extras; and

(g) total fare in $ (total charge).

S.2. Basis of Fare Calculations. – A system may calculate fares upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

S.3. Interference. – For systems that determine distance and time separately there shall be no interference between the time and the distance portions of the mechanism device at any speed of operation.

S.4. Provision for Sealing.

S.4.1. System Security. – A system shall be designed with provisions to ensure that no change can be made that detrimentally affects its metrological integrity.

S.4.2. Changelog. – The system shall provide a changelog, with the information available electronically to the weights and measures official. The changelog shall include a chronological record of all changes affecting the metrological integrity of the system.

S.4.3. Software Authenticity. – Technical means shall be employed to guarantee the authenticity of the loaded software, to ensure that it originates from the owner of the type approval certificate.

S.5. Provisions for Power Loss.

S.5.1. Transaction Information. – In the event of a power loss, the system shall be capable of determining the information needed to complete any transaction in progress at the time of the power loss.

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, a distance test of a system shall be conducted utilizing a distance test or a transfer standard test where applicable.

(a) Specific Distance Test. – The test consists of operating the conveyance over a precisely measured course at least one mile in length.

(b) Transfer Standard Test. – When comparing a system with a calibrated transfer standard, the distance shall be equal to at least the distance traveled on the specific distance test.

N.1.2. Test Procedures. – Not less than two test runs shall be conducted for a distance test and shall be at a speed approximating the average speed traveled by the vehicle in normal service.

N.1.3. Test Conditions. – Tests shall be conducted under conditions that are usual and customary with respect to the location and use of the device.

N.2. Time Test. – A system equipped with a timing device shall be tested during the specific distance and transfer standard tests.

N.3. Isolation Test. – If a system is designed to calculate fares for time and distance separately, tests for time and distance shall be conducted independently.

N.4. Software Tests. – The system software shall be loaded onto a smartphone and tested for authenticity and version number.

T. Tolerances

T.1. Tolerance Values.

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 1 %; and

(b) On Underregistration: 4 %.

T.1.2. Time Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 5 seconds per test; and

(b) On Underregistration: 5 seconds per test.

The CWMA agrees the portion of NIST Handbook 44 addressing personal transportation for hire needs revision to reflect the advancement in technology currently present in the industry and appreciates the efforts of the California Department of Food and Agriculture, Division of Measurement Standards to accomplish this. The CWMA forwarded the item to the NCWM and recommended that it be an Information item at the 2015 NCWM Interim Meeting. At its 2016 Annual Meeting, the CWMA agreed to support the Withdrawal of the item at the submitter's request.

NEWMA, at its 2015 Interim Meeting, forwarded the item to the NCWM with the recommendation it be a Developing item. At its 2016 Annual Meeting, NEWMA Withdrew the item on a recommendation made by the submitter of the item.

At its fall 2015 Annual Meeting, the SWMA forwarded this item to the NCWM, recommending that it be a Developing item and encouraged the submitter to continue developing the GPS specifications and tolerances.

358 MULTIPLE DIMENSION MEASURING DEVICES

358-1 V Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Systems, Table S.4.1.b. Multiple Dimension Measuring Systems Notes for Table S.4.1.a.

(This item was Adopted.)

Source:
NTEP Multiple Dimension Measuring Device Work Group (MDMD) (2016)

Purpose:
Create a new specification in the Multiple Dimension Measuring Devices Code to require that the measurement result of all axes being displayed, printed, or recorded are in the same unit of measure.

Item under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code as follows:

S.1.5. Value of Dimension/Volume Division Units. – The value of a device division "d" expressed in a unit of dimension shall be presented in a decimal format**. The value of "d" for each measurement axis shall be in the same unit of measure and** ~~**with the value of the division**~~ expressed as:

…
(Amended 2016)

Background/Discussion:
All dimensions being measured and used in the calculation of the volume of the object being measured must be the same unit measure so as not to misrepresent the accuracy of the measurement.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee heard comments in support of this item as written from Mr. Russ Vires (SMA) and Ms. Fran Elson-Houston (Ohio Department of Agriculture).

Mr. Robert Kennington (Quantronix, Inc. and Chair of the Multiple Dimension Measuring Device Work Group) supported the item and recommended that the Committee move the item forward with a status of Voting at the 2016 NCWM Annual Meeting.

Ms. Tina Butcher (NIST, OWM) commented that it is reasonable to expect the value of the division "d" for each measurement axis (length, width, and height) of an MDMD to be in the same unit of measure (i.e., all in inches or all in centimeters, etc.). OWM recommends the Committee consider replacing the language in the proposal with the following to improve understanding:

S.1.5. Value of Dimension/Volume Division Units. – The value of a device division "d" expressed in a unit of dimension shall be presented in a decimal format**. The value of "d" for each measurement axis shall be in the same unit of measure and** ~~**with the value of the division**~~ expressed as:

…

In discussing this item, the Committee agreed that the language proposed by OWM would improve understanding of the paragraph and agreed to amend the language as shown in the Item Under Consideration. In consideration of the comments received in support of this item, the Committee also agreed to present the item for a Vote at the 2016 Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee heard comments in support of this item as written from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA; Mr. Robert Kennington (Quantronix, Inc.); speaking on behalf of and as Chair of the Multiple Dimension Measuring Device Work Group; and Ms. Fran Elson-Houston (Ohio).

Ms. Tina Butcher (NIST, OWM) reiterated the comments by provided by OWM at the 2016 NCWM Interim Meeting that it is reasonable to expect the value of the division "d" for each measurement axis (length, width, and height) of an MDMD to be in the same unit of measure (i.e., all in inches or all in centimeters, etc.).

In consideration of the comments received in support of this item, the Committee agreed to present the item for Vote.

Regional Association Comments:
At its 2015 Interim Meeting and 2016 Annual Meeting, NEWMA recommended the item be forwarded to the NCWM as a Voting item.

The CWMA, at both its 2015 Interim Meeting and 2016 Annual Meeting, reported it feels this item is fully developed; comments received were in support of the item. The CWMA recommended the item be forwarded to the NCWM as a Voting Item.

At its fall 2015 Annual meeting, the SWMA forwarded the item to NCWM and recommended that it be a Voting item.

358-2 V Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Systems, Table S.4.1.b. Multiple Dimension Measuring Systems Notes for Table S.4.1.a.

(This item was Adopted.)

Source:
NTEP Multiple Dimension Measuring Devices Work Group (MDMD) (2016)

Purpose:
Provide requirements pertaining to the use of multi-intervals on an MDMD.

Item under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code Table S.4.1.b. as follows:

Table S.4.1.a.
Marking Requirements for Multiple Dimension Measuring System

	Multiple Dimension Measuring Equipment			
To Be Marked With ⇓	**Multiple Dimensions Measuring Device and Indicating Element in Same Housing**	**Indicating Element not Permanently Attached to Multiple Dimension Measuring Element**	**Multiple Dimension Measuring Element not Permanently Attached to the Indicating Element**	**Other Equipment (1)**
Manufacturer's ID	X	X	X	X
Model Designation	X	X	X	X
Serial Number and Prefix	X	X	X	X (2)
Certificate of Conformance Number (8)	X	X	X	X (8)
Minimum and Maximum Dimensions for Each Axis (3)**(9)**	X	X	X	
Value of Measuring Division, d (for each axis and range) **(9)**	X	X	X	
Temperature Limits (4)**(9)**	X	X	X	
Minimum and Maximum Speed (5)**(9)**	X	X	X	
Special Application (6)**(9)**	X	X	X	
Limitation of Use (7)**(9)**	X	X	X	

(Amended 2016)

Table S.4.1.b.
Multiple Dimension Measuring Systems Notes for Table S.4.a.

1. Necessary to the dimension and/or volume measuring system, but having no effect on the measuring value (e.g., auxiliary remote display, keyboard, etc.)
2. Modules without "intelligence" on a modular system (e.g., printer, keyboard module, etc.) are not required to have serial numbers.
3. The minimum and maximum dimensions and measuring division (using upper and lower case type) shall be marked. For example:
   Length: min ___ max ___ d___
   Width: min ___ max ___ d___
   Height: min ___ max ___ d___
4. Required if the range is other than − 10 °C to 40 °C (14 °F to 104 °F)
5. Multiple dimension measuring devices, which require that the object or device be moved relative to one another, shall be marked with the minimum and maximum speeds at which the device is capable of making measurements that are within the applicable tolerances.
6. A device designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and the customer restricting its use to that application.
7. Materials, shapes, structures, combination of object dimensions, speed, spacing, minimum protrusion size, or object orientations that are inappropriate for the device or those that are appropriate.
8. Required only if a Certificate of Conformance has been issued for the equipment.
9. **This marking information may be readily accessible via the display. Instructions for displaying the information shall be described in the NTEP CC.**

(Amended 2004**,** ~~**and**~~ 2008, **and 2016**)

Background/Discussion:
Devices are continually being developed and have less space to include all marking requirements in a legible and readable format. This proposal provides harmonization with existing OIML marking requirements stated in R 129 and the European Measuring Instruments Directive 2014/32/EU.

January 2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee heard comments in support of this item as written from Mr. Russ Vires (SMA), Mr. Scott Henry (Zebra Technologies), and Mr. Sprague Ackley (Honeywell).

Robert Kennington (Quantronix, Inc. and Chair of the Multiple Dimension Measuring Devices Work Group) supported the item and recommended that the Committee move the item forward with a status of Voting at the 2016 NCWM Annual Meeting.

Ms. Tina Butcher (NIST, OWM) commented that OWM understands the need for manufacturers of equipment with limited space in which to display all required marking information, to be able to provide at least some of that information using some alternative means. The information required to be marked on load cells is permitted to appear in an accompanying document for this same reason as noted in this proposal (see NIST Handbook 44, Scales Code Table S.6.3.a. footnote 11). A condition for allowing the information to appear on an accompanying document for a load cell is that the manufacturer's name or trademark, the model designation, and identifying symbols for the model and serial number of the load cell appear on both the load cell and in the accompanying document. Since NIST Handbook 44 requires a serial number to be nonrepetitive, it is the serial number that positively links the required information appearing in an accompanying document to a particular load cell.

NIST, OWM notes that not all information required by Table S.4.1. would be allowed to appear in an accompanying document should the proposal be accepted. The manufacturer's ID, model designation, serial number and prefix, and CC number would still be required to be marked on the device. It is only the information which footnote 9 references in the proposal that could appear in an accompanying document. OWM questions whether or not the configuration

parameters associated with some of the required marking information are changeable depending on the particular device application. For example, it is probable that the value of the measuring division can be changed on some devices (as is the case with the value of "d" on many electronic scales) with its set value based on customer need and the sizes of the boxes being measured. This being the case, an owner's manual that includes a list of all the acceptable division values for which the equipment complies would not meet the marking requirement for the value of the measuring division because it is not specific to the device being inspected. That is, Table S.4.1. requires the value of the measuring division for each axis and range be marked on the device.

NIST, OWM is not opposed to allowing some of the required marking information to be included on an accompanying document, provided the information is specific to the device being inspected and the manufacturer's ID, model designation, serial number and prefix, and CC appear on both the device and in the accompanying document.

In consideration of the comments received in support of this item, the Committee agreed to present the proposal as shown in Item Under Consideration for a Vote at the Annual Meeting.

2016 NCWM Annual Meeting:

At the 2016 NCWM Annual Meeting, the Committee heard comments in support of this item, as written, from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA and Mr. Robert Kennington (Quantronix, Inc.), speaking on behalf of and as Chair of the Multiple Dimension Measuring Device Work Group.

Ms. Tina Butcher (NIST, OWM) commented that the required marking information listed in Table S.4.1.a. and explained in the notes in Table S.4.1.b. of the MDMD Code not only includes make, model, and serial number, but also includes information that is critical to the proper and safe operation of the device. That is, much of this information also aids as a constant reminder to users of the limitations placed on that equipment by the manufacturer. Failure to adhere to those limitations could result in inaccurate measurements and possibly damage to the equipment. Additionally, weights and measures officials rely on this information to determine the conditions and extent of testing that's needed, the tolerances to be applied, and that users of that equipment are operating it properly.

NIST, OWM feels this basic information needs to be displayed on the device, although OWM believes it may be appropriate to allow some of the information to be accessed through a menu on the device, providing everyone could agree on some uniform instructions for accessing the information and those instructions be specified in the MDMD Code. OWM recognizes that documents are easily misplaced and this information is too important for it not to be immediately available to both officials and users of the device. This basic identifying information needs to be made readily available to an inspector and user, and it shouldn't be necessary to search for documents to locate it.

Mr. Scott Henry (Zebra Technologies) proposed removal of the references to an accompanying document in proposed note 9 of the proposal. He indicated that all the marking information identified in the table using the reference "9" could be made readily available from a display. Consequently, there is no need to allow for it to be included on an accompanying document. He then provided the Committee some handwritten changes to proposed (foot)note 9 for its consideration. Ms. Fran Elson-Houston (Ohio) commented that she would like to see Mr. Henry's proposed changes to determine whether or not she could support them. She also indicated that she wanted to see the item move forward.

In discussing this item, the Committee considered whether the changes proposed by Mr. Henry would satisfy the concerns made evident by OWM. The Committee concluded that although they may not fully address all the concerns expressed by OWM, the changes offered were appropriate and would provide some flexibility for a manufacturer to comply with the marking requirements. Consequently, the Committee agreed to amend the new footnote proposed for addition to Table S.4.1.b. by eliminating the option that would allow the required marking information associated with footnote 9 to appear on an accompanying document, yet continuing to permit that information to be readily accessible via the display. The following changes to footnote 9 were agreed to by the Committee:

9. This marking information may be readily accessible via the ~~provided by a~~ display. Instructions for displaying the information shall be described in the NTEP CC. ~~or accompanying document. If an accompanying document is provided, the accompanying document shall include the manufacturers name and model designation.~~

In consideration of the comments received in support of this item, the Committee then recommended the item be presented for a Vote as shown in the Item under Consideration.

Regional Association Comments:
The CWMA, at its 2016 Annual Meeting, reported it believes this item is fully developed and recommended it be a Voting item on the NCWM Agenda.

NEWMA recommended, at both its 2015 Interim and 2016 Annual Meetings, this item be Voting on the NCWM Agenda.

At its fall 2015 Annual Meeting, the SWMA forwarded the item to NCWM and recommended that it be a Voting item.

358-3 V S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division Value) Devices. S.2.2.2. Net Values, Mathematical Agreement, Table 1: Examples of Acceptable Altering of Tare to Achieve Accurate Net Indication, Table 2: Examples of Acceptable Rounding of the Net Result (Following the Subtraction of Tare) to Achieve Accurate Net Indication, Table S.4.1.a., Marking Requirements for Multiple Dimension Measuring Systems, T.2.3. Multi-interval (Variable Division-Value) Devices., T.2.4. Mixed-interval Devices.

(This item was Adopted.)

Source:
NTEP Multiple Dimension Measuring Device Work Group (MDMD) (2016)

Purpose:
Provide requirements pertaining to the use of multi-intervals on an MDMD.

Item under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices (MDMD) Code as follows:

Add new sub-paragraphs S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division- Value) Devices and S.2.2.2. Net Values, Mathematical Agreement beneath existing paragraph S.2.2. Tare as follows:

S.2.2. Tare. – The tare function…

S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division-Value) Devices. – A multi-interval device shall not accept any tare value greater than the maximum capacity of the lowest range of the axis for which the tare is being entered.

(Added 2016)

S.2.2.2. Net Values, Mathematical Agreement. – All net values resulting from a device subtracting a tare entry from a gross value indication shall be indicated and recorded, if so equipped, to the nearest division of the measuring range in which the net value occurs. In instances where the tare value entered on a multi-interval device is in a lower partial measuring range (or segment) than the gross indication, the system shall either alter the tare entered or round the net result after subtraction of the tare in order to achieve correct mathematical agreement.

The following example (of a multi-interval device having two partial measuring ranges for the "x" axis) and accompanying two tables are provided to further clarify the two acceptable methods a device can use to achieve mathematical agreement when tare has been entered in a lower partial measuring range than the gross indication:

Example multi-interval device having two partial measuring ranges for the "x" axis:

- **Partial measuring range 1: 0 – 100 inches by 0.2 inch**
- **Partial measuring range 2: 100 – 300 inches by 0.5 inch**

Table 1: Examples of Acceptable Altering of Tare to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	Tare Entered	Value of Tare after Being Altered by the Device	Acceptable Net Indication
154.5 inches	41.2 inches	41.0 inches	113.5 inches
154.5 inches	41.4 inches	41.5 inches	113.0 inches

Table 2: Examples of Acceptable Rounding of the Net Result (Following the Subtraction of Tare) to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	Tare Entered	Net Result Before Rounding *(Gross Indication Minus Tare Entered)*	Acceptable Net Indication Rounded to Nearest 0.5 inch
154.5 inches	41.2 inches	113.3 inches	113.5 inches
154.5 inches	41.4 inches	113.1 inches	113.0 inches

(Added 2016)

Amend Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Equipment as follows:

Table S.4.1.a.
Marking Requirements for Multiple Dimension Measuring Systems

To Be Marked With ⇓	Multiple Dimension Measuring Equipment			
	Multiple Dimension Measuring Device and Indicating Element in Same Housing	**Indicating Element not Permanently Attached to Multiple Dimension Measuring Element**	**Multiple Dimension Measuring Element not Permanently Attached to the Indicating Element**	**Other Equipment (1)**
Manufacturer's ID	x	x	x	x
Model Designation	x	x	x	x
Serial Number and Prefix	x	x	x	x (2)
Certificate of Conformance Number (8)	x	x	x	x (8)
Minimum and Maximum Dimensions for Each Axis **for <u>Each Range in Each Axis</u>** (3)	x	x	x	
Value of Measuring Division, d (for each axis and range)	x	x	x	
Temperature Limits (4)	x	x	x	
Minimum and Maximum speed (5)	x	x	x	
Special Application (6)	x	x	x	
Limitation of Use (7)	x	x	x	

<u>(Amended 2016)</u>

Amend paragraph T.2.3. Multi-Interval (Variable Division-Value) Devices and add a new paragraph T.2.4.* <u>Mixed-interval Devices.</u> *as follows:

T.2.3. Multi-interval (Variable Division-Value) Devices. – ~~**For multi-interval (variable division-value) devices,**~~ **<u>When there exists two or more partial measuring ranges (or segments) specified for any of the "dimensioning" axes (length (x), width (y), or height (z)) and the division values corresponding to those partial measuring ranges (or segments) within the same "dimensioning" axis differ,</u>** the tolerance values ~~**are**~~ **<u>shall be</u>** based on the value of the ~~**device**~~ division of the range in use.

<u>(Amended 2016)</u>

<u>T.2.4. Mixed-interval Devices. – For devices that measure to a different division value in at least one dimensioning axes and all axes are single range, the tolerance values shall be based on the value of the division of the axis in use.</u>

<u>(Added 2016)</u>

Background/Discussion:
Members of the NTEP Multiple Dimension Measuring Device (MDMD) Work Group (WG) agreed during their May 2015 WG Meeting that the MDMD Code of NIST Handbook 44 does not contain any requirements pertaining to the use of multi-intervals on an MDMD. The WG notes that NIST Handbook 44, MDMD Code paragraph T.2.3., despite

its title (i.e., Multi-interval (Variable Division-Value) Devices) was never intended to apply to devices that measure using multi-intervals in two or more partial measuring ranges within the same axes. Instead, the paragraph applies to devices that measure to a different division value in at least one of the dimensioning axes in comparison to the other two. Multi-interval MDMDs intended for commercial application exist in today's marketplace. The purpose of this proposal is to amend NIST Handbook 44 so as to differentiate between these two different applications and add requirements to address the use of multi-intervals on MDMDs. There are currently no requirements in the MDMD Code of NIST Handbook 44 that apply to the use of multi-intervals on an MDMD, yet equipment with multi intervals currently exists in the marketplace and is intended for commercial use.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee heard comments of support for this item as written from Mr. Russ Vires (SMA) and Ms. Fran Elson-Houston (Ohio Department of Agriculture).

Mr. Robert Kennington (Quantronix, Inc. and Chair of the Multiple Dimension Measuring Device Work Group) supported the item and recommended that the Committee move the item forward with a status of Voting at the 2016 NCWM Annual Meeting.

Ms. Tina Butcher (NIST, OWM) reported that this proposal was developed and submitted by the NCWM MDMD WG to make possible the improved harmonization of United States and Canadian type evaluation criteria. That is, the MDMD WG identified a number of gaps in NCWM Publication 14 when comparing United States and Canadian type evaluation criteria and before a recommendation can be made to the NTEP Committee to address these gaps, there needs to be some NIST Handbook 44 requirements in place, which allow for the changes. There are three main parts to this proposal. Each main part is intended to address a particular gap associated with the inspection of an MDMD equipped with multi-intervals as follows:

1. The maximum value of tare for multi-interval MDMDs;

2. How mathematical agreement is to be met when a tare is entered in a lower measuring range than the range in which the measurement will take place;

3. The application of tolerances to multi-interval and mixed interval MDMDs.

In developing the proposal to address mathematical agreement, the MDMD Work Group recognized the differences in the requirement in the Scales Code from that being proposed for the MDMD Code. That is, the Scales Code (paragraph S.1.2.1.) provides a means for mathematical agreement to be met without the need to round or alter any values by allowing the net weight indication to be expressed in a value other than 1, 2, or 5, or a decimal multiple or submultiple of 1, 2, or 5 when a tare is taken in a lower weighing range and subtracted from a gross weight in a higher weighing range. The proposal, on the other hand, offers no such provision and requires the net value be indicated and recorded, if so equipped, to the nearest division of the measuring range in which the net value occurs. Thus, in instances where a tare value is entered on a multi-interval device in a lower partial measuring range than the gross indication, the system must either alter the tare entered or round the net result after subtraction of the tare in order to achieve mathematical agreement in accordance with the proposal.

In its decision to deviate from drafting a proposal similar to the requirement in the Scales Code, the WG considered the following:

- The proposal (i.e., proposed paragraph S.2.2.2.) reflects what is considered acceptable by Canadian standards with respect to the net measurement result when tare is taken on a multi-interval MDMD.

- Tare is not a feature typically used on MDMDs by U.S. shipping companies.

- Scales Code paragraph S.1.2.1. does not prohibit the rounding of either the tare value or the net weight indication to achieve mathematical agreement on a multi-interval scale in instances where a tare value is entered in a lower weighing range than the gross weight indication. Instead, the word "may" is used rather than "shall" to describe how the subtraction of a value is to occur.

- Members of the WG acknowledged that very few, if any, multi-interval MDMDs are known to exist in the U.S. marketplace.

OWM believes the proposal as written is appropriate and would allow for the improved harmonization of United States and Canadian type-evaluation criteria.

In consideration of the comments received in support of this item, the Committee agreed to present this item for a Vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee heard comments in support of this item, as written, from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA; Mr. Robert Kennington (Quantronix, Inc.), speaking on behalf of and as Chair of the Multiple Dimension Measuring Device Work Group; and Mr. Scott Henry (Zebra Technologies).

The Committee also heard support for this item from Ms. Tina Butcher (NIST, OWM), and Ms. Fran Elson-Houston (Ohio).

In consideration of the comments received in support of this item, the Committee recommended it be presented for Vote.

Regional Association Comments:
The WWMA, at its 2015 Annual Meeting, noted that the MDMD Work Group expressed support for this proposal as a Voting item. The WWMA has concerns about rounding rules applied in this proposal with respect to tare. It is possible for the tare to round to a smaller value or possibly no value as indicated in the example found in Table 1 when the device converts to a larger division size. The WWMA recommends that the device shall retain the correct tare value from the lower range when the device transitions to a higher range. The WWMA suggests that the submitter review the Scales Code 2.20., S.1.2.1. Digital Indicating Scales Units, for potential reference. The WWMA forwarded the item to the NCWM, recommending that it be a Developing item with modifications as follows:

S.2.2. Tare. – The tare function…

S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division-Value) Devices. – A multi-interval device shall not accept any tare value greater than the maximum capacity of the lowest range of the axis for which the tare is being entered.

S.2.2.2. Net Values, Mathematical Agreement. – All net values resulting from a device subtracting a tare entry from a gross value indication shall be indicated and recorded, if so equipped, to the nearest division of the measuring range in which the net value occurs. In instances where the tare value entered on a multi-interval device is in a lower partial measuring range (or segment) than the gross indication, the system shall either alter the tare entered or round the net result after subtraction of the tare in order to achieve correct mathematical agreement.

The following example (of a multi-interval device having two partial measuring ranges for the "x" axis) and accompanying two tables are provided to further clarify the two acceptable methods a device can use to achieve mathematical agreement when tare has been entered in a lower partial measuring range than the gross indication:

Example multi-interval device having two partial measuring ranges for the "x" axis:

- **Partial measuring range 1: 0 – 100 inches by 0.2 inch**
- **Partial measuring range 2: 100 – 300 inches by 0.5 inch**

Table 1: Examples of Acceptable Altering of Tare to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	Tare Entered	Value of Tare after Being Altered by the Device	Acceptable Net Indication
154.5 inches	41.2 inches	41.0 inches	113.5 inches
154.5 inches	41.4 inches	41.5 inches	113.0 inches

Table 2: Examples of Acceptable Rounding of the Net Result (Following the Subtraction of Tare) to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	Tare Entered	Net Result Before Rounding *(Gross Indication Minus Tare Entered)*	Acceptable Net Indication Rounded to Nearest 0.5 inch
154.5 inches	41.2 inches	113.3 inches	113.5 inches
154.5 inches	41.4 inches	113.1 inches	113.0 inches

Amend Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Equipment as follows:

Table S.4.1.a.
Marking Requirements for Multiple Dimension Measuring System

To Be Marked With ⇓	Multiple Dimension Measuring Equipment			
	Multiple Dimensions Measuring Device and Indicating Element in Same Housing	Indicating Element not Permanently Attached to Multiple Dimension Measuring Element	Multiple Dimension Measuring Element not Permanently Attached to the Indicating Element	Other Equipment (1)
Manufacturer's ID	x	x	x	x
Model Designation	x	x	x	x
Serial Number and Prefix	x	x	x	x (2)
Certificate of Conformance Number (8)	x	x	x	x (8)
Minimum and Maximum Dimensions for Each Axis **for Each Range in Each Axis** (3)	x	x	x	
Value of Measuring Division, d (for each axis and range)	x	x	x	
Temperature Limits (4)	x	x	x	
Minimum & Maximum speed (5)	x	x	x	
Special Application (6)	x	x	x	
Limitation of Use (7)	x	x	x	

Amend paragraph T.2.3. Multi-Interval (Variable Division-Value) Devices and add a new paragraph T.2.4.* Mixed-interval Devices. *as follows:

T.2.3. Multi-interval (Variable Division-Value) Devices. – ~~**For multi-interval (variable division-value) devices,**~~ **When there exists two or more partial measuring ranges (or segments) specified for any of the "dimensioning" axes (length (x), width (y), or height (z)) and the division values corresponding to those partial measuring ranges (or segments) within the same "dimensioning" axis differ,** the tolerance values ~~**are**~~ **shall be** based on the value of the ~~**device**~~ division of the range in use.

T.2.4. Mixed-interval Devices. – For devices that measure to a different division value in at least one dimensioning axes and all axes are single range, the tolerance values shall be based on the value of the division of the axis in use.

At both its 2015 Interim Meeting and 2016 Annual Meeting, NEWMA recommended the item be presented as a Voting item on the NCWM agenda.

The SWMA, at its 2015 Annual Meeting, forwarded the item to NCWM and recommended that it be a Voting item.

The CWMA, at its 2015 Interim Meeting reported the item has merit and should remain Developing. At its 2016 Annual Meeting, the CWMA reported it feels the item is fully developed and the comments received were in support of the item. The CWMA recommended the item be Voting on the NCWM Agenda.

360 OTHER ITEMS

360-1 D Electric Watthour Meters Code under Development

Source:
NIST OWM (2016)

Purpose:
Create a Developing item for inclusion on the NCWM S&T Committee Agenda where progress of the USNWG can be reported as it develops legal metrology requirements for electric watthour meters and continues work to develop test procedures and test equipment standards, including the following.

1. Make the weights and measures community aware of work being done within the U.S. National Work Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for electric watthour meters used in submeter applications in residences and businesses.

2. Encourage participation in this work by interested regulatory officials, manufacturers, and users of electric submeters.

3. Allow an opportunity for the USNWG to provide regular updates to the S&T Committee and the weights and measures community on the progress of this work.

4. Allow the USWNG to vet specific proposals as input is needed.

Item under Consideration:
This item is currently under development and there is not yet any specific proposal for consideration by the NCWM or the weights and measures community.

Background/Discussion:
In 2012, NIST, OWM formed the U.S. National Working Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for commercial electricity-measuring devices (including those used in sub-metering electricity at residential and business locations and those used to measure and sell electricity dispensed as a vehicle

fuel) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).

In 2013, the NCWM adopted changes recommended by the USNWG to the NIST Handbook 130 requirements for the Method of Sale of Commodities to specify the method of sale for electric vehicle refueling. At the 2015 NCWM Annual Meeting, the NCWM adopted NIST Handbook 44, Section 3.40. Electric Vehicle Refueling Systems developed by the USNWG.

This Developing item is included on the Committee's agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) to keep the weights and measures community apprised of USNWG current projects, including the following:

- The USNWG continues to develop recommended test procedures for inclusion in a new EPO 30 for Electric Vehicle Refueling Equipment along with proposed requirements for field test standards.

- The USWNG is continuing work to develop a proposed code for electricity-measuring devices used in sub-metering electricity at residential and business locations. This does not include metering systems under the jurisdiction of public utilities. The USNWG hopes to have a draft code for consideration by the community in the 2016 - 2107 NCWM cycle.

The inclusion of Developing items on both the L&R and S&T Committee agendas is intended to provide for a venue to allow the USNWG to update the weights and measures community on continued work to develop test procedures and test equipment standards. These items will also provide a forum for reporting on work to develop proposed method of sale requirements for electric watthour meters and a tentative device code for electric watthour meters in residential and business locations and serve as a placeholder for eventual submission of these proposals for consideration by NCWM. The USNWG welcomes input from the community on this work.

For additional information, contact USNWG Chairman Tina Butcher at tbutcher@nist.gov or (301) 975-2196 or Technical Advisor, Juana Williams at Juana.williams@nist.gov or (301) 975-3989

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee received an update on the progress of this item from Ms. Tina Butcher (NIST, OWM). Several officials voiced support for the continued development of the Electric Watthour Meters Code. In consideration of the comments received in support of the item, the Committee agreed to recommend the item continue in a Developing status.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Ms. Tina Butcher (OWM) provided an update on the development of this item, which summarized the following written OWM comments and recommendations provided to the Committee during the meeting:

The USNWG on Electric Vehicle Fueling and Submetering last met on July 6, 2016. The following summarizes key activities and issues currently under development in the USNWG:

- ***Restructuring of USNWG:***
  Since its inception, the scope of the USNWG has included the development of proposed standards, test procedures, and other requirements for (1) electric vehicle fueling systems; and (2) electric watthour meters used as submeters (in applications falling under the jurisdiction of weights and measures jurisdictions). Following the adoption by the NCWM of the Tentative Code on Electric Vehicle Fueling Systems in July 2015, the USNWG recognized that individuals may have an interest in only one or the other topic, though some may have an interest in both areas. The USWNG is reviewing proposed modifications to its charter which will restructure the WG into one subgroup to address electric vehicle refueling and another subgroup to address electric watthour meters. This will allow the group to more efficiently address these two areas of work.

- ***Test Equipment and Test Procedures for Electric Vehicle Fueling Systems:***
  A Subcommittee, chaired by Mr. Ted Bohn, Argonne National Laboratory, continues to work on the development of recommended criteria for test equipment and test procedures. The Subcommittee last met in March 2016. Multiple field trials are planned to vet proposed test procedures. At least two companies have developed prototype field standards for use by weights and measures jurisdictions and service personnel for testing EVSE in the field.

- ***Electric Watt Hour Meters:***
  A draft NIST Handbook 44 code for electric watthour meters was circulated to the USNWG in November 2015. This draft was extracted from an original draft code drafted by NIST several years ago that included requirements for both electric watthour meters and electric vehicle refueling systems.

  The USNWG plans to hold an in-person meeting late fall 2016 to continue work on the draft code. Both California Division of Measurement Standards and Ohio Weights and Measures have graciously offered to host this meeting.

In consideration of the ongoing work on this item, the Committee agreed to maintain its Developing status.

Regional Association Comments:
NEWMA and the SWMA, at their 2015 Annual Meetings, forwarded this item to NCWM, recommending it be a Developing item. NEWMA also recommended the item be Developing at its 2016 Annual Meeting in consideration of the ongoing work by the USNWG to develop the item.

The CWMA recommended, at its 2016 Annual Meeting, the item be Developing on the NCWM Agenda and indicated it feels the item has merit and comments received were in support of the item.

360-2 W Appendix A – Fundamental Considerations, 2.1. Acceptance and Maintenance Tolerances

(This item was Withdrawn.)

Source:
Ross Andersen, Retired (2016)

Purpose:
Amend Section 2.1 of Fundamental Considerations to make it more effectively explain the purpose and application of NIST, Handbook 44 tolerances.

Item under Consideration:
Amend NIST Handbook 44, Appendix A, Fundamental Considerations as follows:

~~**2.1. Acceptance and Maintenance Tolerances. – The official tolerances prescribed by a weights and measures jurisdiction for commercial equipment are the limits of inaccuracy officially permissible within that jurisdiction. It is recognized that errorless value or performance of mechanical equipment is unattainable. Tolerances are established, therefore, to fix the range of inaccuracy within which equipment will be officially approved for commercial use. In the case of classes of equipment on which the magnitude of the errors of value or performance may be expected to change as a result of use, two sets of tolerances are established: acceptance tolerances and maintenance tolerances.**~~

~~**Acceptance tolerances are applied to new or newly reconditioned or adjusted equipment, and are smaller than (usually one-half of) the maintenance tolerances. Maintenance tolerances thus provide an additional range of inaccuracy within which equipment will be approved on subsequent tests, permitting a limited amount of deterioration before the equipment will be officially rejected for inaccuracy and before reconditioning or adjustment will be required. In effect, there is assured a reasonable period of use for**~~

~~equipment after it is placed in service before reconditioning will be officially required. The foregoing comments do not apply, of course, when only a single set of tolerance values is established, as is the case with equipment such as glass milk bottles and graduates, which maintain their original accuracy regardless of use, and measure-containers, which are used only once.~~

2.1. Equipment Tolerances. – The official tolerances prescribed by a weights and measures jurisdiction for commercial equipment are the limits of inaccuracy officially permissible within that jurisdiction. These limits are set by means of tolerances which are codified to fix the range of inaccuracy within which equipment will be approved for commercial use when undergoing official tests. Alternatively, equipment that is performing outside these tolerance limits will be rejected and removed from service.

Regulatory decisions, to either approve or reject equipment, come with risks. Measurements are imperfect; meaning measurement without error is unattainable. All measurements involve rounding to the chosen increment of scale, all are subject to random variations, and all are affected by influences, disturbances, biases, and drift. This applies equally to the measurements being made by the commercial equipment, and to the official measurements made to verify that equipment. With these unavoidable uncertainties in the measurements, it is possible, and in fact likely, that compliant equipment will sometimes be rejected and non-compliant equipment will sometimes be approved. The regulatory approach used in this handbook recognizes the risks, attempts to limit the risks to reasonable levels, and, most importantly, balances the risks between buyer and seller. The approach has three primary concerns; accurate official standards, uniform test procedures, and limited equipment variability.

Accurate Official Standards – Each of the specific codes in the handbook prescribes the appropriate verification standards for official testing. The error in the verification standards is limited by a separate set of tolerances that are smaller than the tolerances applied to the equipment under test. These tolerances (see Part 3 of this Appendix) limit the biases imparted to the test directly from any error or bias inherent in the standards. However, these tolerances for the standards do not address the effects of influences, disturbances and drift on the standards when used in official testing.

Uniform Test Procedures – Each of the specific codes in this handbook prescribes uniform test procedures in the Notes section for various types of commercial equipment. These procedures evaluate equipment performance under varying operating conditions consistent with normal usage. The official performing the tests should ensure the procedures are followed meticulously so as to minimize the variability from these procedural sources. Although the procedures may be performed correctly, it is not possible to eliminate the effects of random variations, influences, disturbances, and biases from the procedures.

Limited Equipment Variability – Each of the specific codes in this handbook recognizes a reasonable amount of variability normally expected for each type of commercial equipment and the unique commodities or services measured. The equipment is subject to the effects of random variations, influences, disturbances, biases, and drift. In addition, the commodities and services are variables, as their properties affect how they are measured by the equipment.

Any official test result includes the variability from all three of the sources described above. When dealing with this variability, however, it is not practical to evaluate testing uncertainties for each inspector and each individual piece of equipment. The costs would be enormous to the regulatory agencies. Instead, the regulatory approach used in this Handbook is to view the process in terms of the tests on the entire population rather than on the single piece of equipment. In this context, the variability of the combined measurement is not a simple sum of the three parts, but rather a combination based on probabilities. We can express those probabilities using standard deviations (sd) for each of the terms. If we use S for standards, P for procedures and E for equipment, then we can express the total variation of the system using the formula below.

Total Variability = $\sqrt{(sd^2S + sd^2P + sd^2E)}$

Essentially the prescribed tolerance limit is a formal cap to equipment variability including variation from all sources in the verification, (i.e., variability in the standards and in the performance of prescribed test procedures). (See General Code G-S.5.4.) If the variability of the standards and the test procedure are small relative to that of the equipment, their impact on the total variability can be shown to be relatively small. Thus, the equipment variability emerges as the primary source of the variation within the population. Measurement science confirms that measurement performance behaves normally, producing a population that has probabilities approximating a bell-shaped curve. It is critical to understand that the probabilities of false rejection and false acceptance are equal under this approach and the risks are equally distributed between buyers and sellers. The tolerance limits serve to identify individual pieces of equipment in the tails of the bell that should be rejected and then adjusted back to the middle of the population. Examples of the impacts of various levels of variability for the three components are shown in the table below.

sd Equipment	sd Standards	sd Procedures	sd Total Variability	*Contribution of Equipment %
1	1/3	1/3	1.106	90
1	1/4	1/4	1.061	94
1	1/5	1/5	1.039	96
1	1/10	1/10	1.010	99

Contribution of Equipment % is calculated as sd Equipment/sd Total Variability*100

The general rule for tolerance application pertains to equipment that is adjustable. It employs two levels of tolerances, acceptance tolerances and maintenance tolerances, where acceptance tolerance values are generally one-half the value of maintenance tolerances. These tolerances are applied based on a timeline. The timeline begins when the equipment is initially placed in service and ends when the equipment is either officially rejected, undergoes a major reconditioning or overhaul, or is decommissioned by the user.

A) Tolerances when placed in service: Equipment is tested when it is initially placed in service. Based on the test result(s), it is adjusted to bring performance error(s) as close as practicable to zero error. In addition, all errors must be within the acceptance tolerances. (See General Code Paragraphs GUR.4.3. and GT.1.) However, when making any adjustment it is not possible to know the impacts of the random variations, influences, disturbances, and biases on the measurements at that moment. By adjusting as close as practicable to zero error, there is a balanced risk of introducing bias in the equipment to either overregister or underregister (but still perform within the acceptance tolerance). Thus, over the entire population of equipment, the adjustments result in equipment performance that is bunched close to zero error and a population that is not skewed in favor of either buyer or seller.

B) Tolerances on official tests made within the first 30 days after placement in service: In the first 30 days after adjustment, acceptance tolerances are applied to any official tests of the equipment. Over a 30-day period after adjustment, the range of influences is expected to be small and there should be minimal drift in the equipment, thus the smaller acceptance tolerances are deemed appropriate.

C) Tolerances on official tests made 31 or more days after placement in service: For any official test after the first 30 days in service, maintenance tolerances are applied. This larger tolerance recognizes the effects of a full range of influences and allows for small amounts of drift before the equipment will be officially rejected and require readjustment, repair, or major reconditioning or overhaul. Provided performance is maintained within the maintenance tolerances, the equipment can remain in service indefinitely. However, any out-of-tolerance performance in an official test is grounds for rejection and this creates a new timeline starting again at placement in service.

The special rule for tolerance application pertains to devices that at not adjustable, like steel tapes, timing devices, glass graduates, and measure-containers. For these devices the specific code prescribes only a

single level of tolerances that are applied in all official tests of the equipment. These tolerances are applicable at all times the device is in service.

Background/Discussion:
The submitter provided the following statements:

Recent discussions within the Work Group on Multi-Point Calibrations have, I believe, exposed a significant weakness in this section of the Fundamental Considerations. Those discussions revealed that people may misunderstand what tolerances are for and why they are necessary. In particular, I would point to the following sentences from the first and second paragraphs of Section 2.1.:

In the case of classes of equipment on which the magnitude of the errors of value or performance may be expected to change as a result of use, two sets of tolerances are established: acceptance tolerances and maintenance tolerances. (emphasis added)

Maintenance tolerances, thus, provide an additional range of inaccuracy within which equipment will be approved on subsequent tests permitting a limited amount of deterioration before the equipment will be officially rejected for inaccuracy and before reconditioning or adjustment will be required. (emphasis added)

These passages seem to suggest that any change in performance in a commercial device performance between tests is due to deterioration, or to be more precise, instrumental drift. I strongly believe this section has reinforced some poor assumptions by failing to recognize that variability in test results are most often due to the impact of influences and other random factors. We easily recognize influences that change device performance over short time frames. Consider the impact of flow rate on many metering devices. We can imagine a single performance curve of delivery error vs. flow rate where the errors at minimum rated flow rate show underregistration (plus error) but are close to zero error at maximum delivery rate. This is why we test both at normal and low flow rates. With a limited timeframe, there is a tendency to think those results are representative of all possible test conditions.

However, if we collect data over an extended time period we see that changes in viscosity may not only offset the device performance curve but also change the shape of the flow rate curve. I have seen test results from Measurement Canada's volumetric lab on a positive displacement meter using the same product at temperatures of 0 °C, 15 °C and 30 °C. Their analysis clearly shows that performance changes reached 0.4 % at fast flow over a 30 °C range for diesel fuel. These changes were shown to correlate very closely with the observed change in viscosity due to temperature. For Petrosol over the same temperature range, the difference was about 0.34 %. I think this makes sense as the change in viscosity over temperature will be less for products with lower viscosity.

In 1986, the entire Scales Code was revised. A major part of that revision was the inclusion of tolerances for influence factors. We began to understand why some scales set to zero in the summer failed when tested in the winter and vice versa. These failures weren't being caused by instrumental drift, i.e., permanent changes in performance. It was just a case of the normal range of influences on the output of the load cells. The code changes required production of load cells that could maintain performance within acceptance tolerance over the temperature ranges a device should normally see. No one picked up that this section in Fundamental Considerations should have been changed when influence factor tolerances were added to the Scales Code, but not only for the Scales Code. It should have been changed for all codes since influences affect all measurements. This proposal seeks to correct that omission and give influences and other sources of variability due recognition in the explanation of how tolerances work in NIST Handbook 44.

There is another related issue, which requires us to understand the real purpose of G-S.5.4. Because the title of G-S.5.4. includes the term "repeatability" and we have tests for repeatability, people think this paragraph refers only to repeatability tests. Instead I suggest it refers to any and all tests. It can't reasonably be restricted to repeatability tests because the second sentence clearly covers performance under varying conditions. In a repeatability test, you are required to test under only one set of conditions.

If I ask you to point out where in the NIST Handbook 44 codes it specifically says that a device must perform within tolerance, where would you point? The tendency is to point either to the tolerance sections of either the General Code or the specific codes. However, those sections only declare what the tolerances values are when you are to apply the various types of tolerances. Nowhere in these sections can you find it clearly stated that the commercial device is required to conform to the tolerances. You can try to stretch it from the general meaning of the term tolerance, but I think that is unnecessary. The specific code requirement requiring performance within tolerances under all test conditions is G-S.5.4.! It is by extension that we expect the equipment to perform within tolerance under normal conditions of use.

There is another critical bit of text in G-S.5.4. that significantly affects our application of tolerances. It deals with the text: "repeated performance of steps or operations that are embraced in the testing procedure." We have to understand why this text is there. My explanation is the text is necessary to specifically explain that the prescribed tolerances include all of the uncertainties associated with the test procedures and the standards used in the tests. It says clearly that you do not need to make any further allowances or corrections for uncertainties when performing the prescribed tests with suitable standards (see Fundamental Considerations Section 3).

This becomes clearer if we parse the sentence to its basic elements.

G-S.5.4. Repeatability of Indications. – A device shall be capable of repeating, within prescribed tolerances, its indications and recorded representations. This requirement shall be met irrespective of *condition A* and of *condition B.*

Note that because of the underlined and, both conditions A and B must be met simultaneously.

Condition A is – "repeated manipulation of any element of the device in a manner approximating normal usage (including displacement of the indicating elements to the full extent allowed by the construction of the device and repeated operation of a locking or relieving mechanism)."

Condition B is – "the repeated performance of steps or operations that are embraced in the testing procedure."

Metrology has several ways of dealing with measurement uncertainty in the verification process, where uncertainties are well established. One method is to explicitly state the uncertainties, as is done for most calibration work. Another method is called guard banding. This method essentially reduces the applicable tolerance by the uncertainty of the test. Thus, if the prescribed equipment tolerance is ± 10 units and the test uncertainty is ± 2 units, then you pass only equipment with errors up to ± 8 units. In the case of field tests of commercial devices, guard banding may not be feasible because it requires rigorous evaluation of the test uncertainty. I don't believe that many of us in the enforcement areas have the resources to fully evaluate those test uncertainties. It would require each and every inspector to be evaluated individually over a range of devices and varying test conditions. I would add that it is unreasonable to assert that this has ever been the accepted application of the tolerances in HB44. A third method is the Test Uncertainty Ratio. In this method you establish a limit to test uncertainty that is small relative to the performance limits, i.e. usually something like 4:1.

Handbook 44 is not using any of these methods because the measurement uncertainty of the verification of commercial equipment is not well established. Instead it is using a method that aims to control the population of devices using a broad probabilistic approach. What the revisions to this section do is attempt to clarify that performance changes in equipment that we observe in official tests can be caused by a variety of causes including influences on the equipment as well as variability in the test. These tend to be the dominant causes of variability and we will find that the instrumental drift that was the target of the original text is really a minor effect. The tolerances in HB44, both on the standards and on the equipment, recognize reasonable variations but provide black-and-white pass-fail decision criteria for the inspector when conducting official tests. The overall outcome is a population that fits a bell curve centered at zero error.

While the revised text is somewhat longer than the original, I believe it is necessary to discuss all of the important measurement variables in this section and explain how they are addressed in the regulatory approach of HB44. This fills a void that I believe exists in the original text.

2016 NCWM Interim Meeting:
Mr. Ross Anderson (New York, retired) provided an explanation on the system of tolerances and explained the rationale for the current regulatory framework.

Ms. Tina Butcher (NIST, OWM) and Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) suggested that the proposal may be better used in training material instead of NIST Handbook 44.

The Committee agreed that the content of the proposal could be incorporated into future training material rather than into NIST Handbook 44 and decided to withdraw this item in consideration of the comments and suggestions provided.

Regional Association Meetings:
At its 2015 Annual Meeting, the WWMA received comment from one regulator that this item may call into question the integrity of the tolerance specifications found in NIST Handbook 44 and may have other unintended consequences. The WWMA believes that elements of this proposal may have merit, but does not believe that NIST Handbook 44 is the appropriate place for this level of detail. It may unnecessarily complicate the fundamental understanding of acceptance and maintenance tolerances. The WWMA did not forward this item to NCWM and recommends that it be Withdrawn.

The CWMA reported at its 2015 Interim Meeting, it would like to have more clarification as to the need to revise this part of NIST Handbook 44. The CWMA forwarded it to the NCWM and recommended that it be a Developing item.

NEWMA, at its 2015 Interim Meeting, stated that this item is developed and forwarded it to NCWM, recommending it be an Information item:

At its 2015 Annual Meeting, the SWMA reported it doesn't believe this item is necessary and current language is sufficient. The SWMA did not forward this item to NCWM and recommends that it be Withdrawn.

360-3 I Appendix D – Definitions: Batching System (See Related Item 320-1)

Source:
Richard Suiter Consulting (2016)

Purpose:
Add a definition to NIST Handbook 44, Appendix D for batching systems.

Item under Consideration:
Amend NIST Handbook 44, Appendix D, Definitions as follows:

batching system. – One in which materials are measured in pre-determined quantities by weight and/or liquid measure. [2.20]

Background/Discussion:
Even though there are numerous batching systems in the marketplace and several batching systems, both manual and automated, have an NTEP CC, there is no definition in NIST Handbook 44 to differentiate this system from other types of weighing and measuring systems. Weights and measures officials seeing a system for the first time, particularly if automated, may have difficulty in determining what section of the Scales Code to apply. This definition will assist those officials in making that determination. The SMA Handbook of Terms and Definitions Fourth Edition 1981 includes a definition for batching systems; however, for some reason that definition has never been added to NIST Handbook 44. The definition for batching scales also has never been added even though Paragraph S.1.2. Value of Scale Division Units, makes an exception for "batching scales and weighing systems."

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee agreed to group Item 320-1 and 360-3 together and receive comments simultaneously on these two items. See Item 320-1 for a summary of the comments received and Committee considerations regarding these two items.

The Committee agreed to amend the proposed definition of "batching system" by deleting the word "raw" as was done by the WWMA S&T Committee at its 2015 Annual Meeting and proposed by the SMA. The Committee further agreed to present the item for Vote as shown in Item Under Consideration at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Ms. Tina Butcher (NIST, OWM) indicated that the purpose of Appendix D of NIST Handbook 44 is to define terms that are used in one or more of the codes in the handbook and to specify how they are intended to apply in those codes. The term "batching system" does not appear in the Scales Code of NIST Handbook 44 and, therefore, it would be inappropriate to include a definition in NIST Handbook 44 with a reference to that code.

She stated that the term "batching scale" does appear in NIST Handbook 44; however, there is no definition in NIST Handbook 44 for the term. The following definition appears in a 1975 edition of a publication titled, "Terms and Definitions for the Weighing Industry" once made available by the SMA:

> **BATCHING SCALE,** N. Any scale which, by design or construction, lends itself readily to use in proportioning admixtures by weight.

OWM does not consider a batching scale and batching system the same device given the differences in the two definitions provided. That is, the definition of the term "batching scale" from the SMA publication differs from the definition of the term "batching system" presented in the proposal.

Ms. Butcher also indicated that OWM does not understand the purpose of the proposal, that is, what the submitter is trying to achieve by proposing a new definition be added. If adding a definition and referencing it to the Scales Code is to recognize the existence of some automated batching systems in which the scales used in those systems return to zero-load balance after each draft load is discharged from the weighing/load-receiving element when being used in automatic operation, the Scales Code already addresses the operation of those scales. She noted that OWM had already acknowledged in earlier comments, the existence of some automated weighing systems that by virtue of their design, fail to meet the definition of an ABWS and, therefore, the application of the ABWS Code; yet, these systems retain a "heel" following the discharge of the product comprised in each draft. The heel is part of the load that has failed to discharge during the discharge cycle. To determine accurately the amount of product discharged in each draft, these systems must take into account the weight of each remaining heel and subtract it from the weight indicated for its corresponding load. OWM believes the reason Kansas has submitted a proposal to update the ABWS Code (S&T agenda Item 322-2) is to address these systems. Adding a new definition and referencing it to the Scales Code might tend to confuse some into believing such systems don't necessarily have to start each draft load from a zero-load balance condition or take into account the weight of each remaining heel, which would be a false conclusion.

She recommended that, if the submitter of this proposal believes a gap exists in the Scales Code and that gap is the application of that code to some of the weighing equipment used in a particular type of batching operation, then a proposal that identifies that equipment, along with corresponding proposed requirements to be applied, should be drafted and submitted for consideration. It would be inappropriate to consider the addition of a new definition into NIST Handbook 44 until a proposal supporting the inclusion of the term into the code has been submitted to the S&T Committee and adopted.

Mr. Richard Suiter (Richard Suiter Consulting, LLC) commented that the term "automated batching systems" appeared in an earlier "companion" proposal to amend the Scales Code of NIST Handbook 44, but the earlier proposal had been Withdrawn by the Committee at the 2016 NCWM Interim Meeting. It was his intent in offering the two proposals, to try and differentiate between the scales used in an automated batching system from those used in other weighing applications. He pointed out that the terms "batching scales" and "weighing systems" appear in Scales Code paragraph S.1.2. and that he believes the definition being proposed would fit these terms. He indicated there was a

need for NIST Handbook 44 to define "batching scale" and "batching systems" and asked the Committee to consider agreeing to an Information status on the item to allow for its further development.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA reported that the SMA opposes the item because currently there are no specifications and tolerances defined to support the definition.

Mr. Henry Oppermann, (W&M Consulting, LLC) reported that he had submitted written comments to the Committee in opposition to the item. He stated the proposed definition is incorrect and inappropriate based on the written comments provided.

In consideration of the comments received on this item and the submitter's request to the Committee to assign an Information status to the item to allow time for him to develop a new Scales Code proposal intended to address scales used in batching systems, the Committee agreed to maintain the item as an Information item on its agenda.

Regional Association Comments:
During its 2015 Annual Meeting, the WWMA S&T Committee decided to strike the word "raw" from the proposal due to concerns that it might be viewed as unnecessarily restrictive. No opposition to this action was voiced during the voting session. The WWMA forwarded the item to the NCWM with the recommendation that it be a Voting item as amended below:

> **batching system. –** One in which ~~**raw**~~ materials are measured in pre-determined quantities by weight and/or liquid measure. [2.20]

The CWMA reported at its 2015 Interim Meeting, it agrees that the terms "batching scale" and "batching system" are commonly used terms and should be defined. The CWMA forwarded the item to the NCWM and recommended that it be a Voting item. At its 2016 Annual Meeting, the CWMA recommended the item move forward as an Information item based on a request to downgrade the status of the item by the submitter.

NEWMA commented that this item is developed and forwarded it to NCWM, recommending it be a Voting item at its 2015 Interim Meeting. However, at its 2016 Annual Meeting, NEWMA reported it cannot recommend the item as Voting because Item 320-1 (a companion item) was Withdrawn and it was commented that there is no benefit to adding a definition unless this item was adopted. NEWMA recommended that it be an Information item to see how it can be defined.

360-4 V Appendix D – Definitions: Calibration Parameter

(This item was adopted.)

Source:
NCWM Multi-Point Calibration Group (MPCG) (2015)

Purpose:
Update the definitions in Appendix D to reflect advances in device calibration technology.

Item under Consideration:
Amend NIST Handbook 44, Appendix D – Definitions as follows:

> **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, **3.31, 3.32, 3.34, 3.35,** 3.37, **3.38, 3.39,** 5.56(a)**, and 5.58**]
>
> **(Amended 2016)**

Background/Discussion:

Calibration parameter.

In 2006, "calibration parameter" was added to sections 3.31., 3.32., 3.34., and 3.35.; these sections now need to be added to the reference string in the definition of "calibration parameter."

Multi-point calibrated device.

New technology makes it possible to use linearization factors to optimize accuracy at multiple measurement points on devices such as meters, weighing devices, and other devices. This new technology requires a term so that devices capable of being optimized at multiple measurement points can be distinguished from devices with single point calibration. The term is used in proposals already before the Committee, and if those proposals are adopted, the term should be included in the definitions. Multi-point calibrated devices are increasingly used as commercial scales and meters. Whether or not the current meter proposals are adopted, the Conference will need to have a term to describe these devices.

In addition to proposing additional code references be added within the bracketed area immediately following the definition of "calibration parameter" in Appendix D of NIST Handbook 44, this item also previously proposed that a new definition for the term "Multi-point calibrated device" be added to Appendix D. See the Committee's 2015 Annual Report for additional background information on this item, including the Committee's decision to eliminate the proposed new definition from the proposal.

2016 NCWM Interim Meeting:

Mr. Clark Cooney (California, DMS) and former NIST representative on the NCWM Multi-Point Calibration Group said that the proposal includes references to additional sections where the term "calibration parameter" was used. He recommended removing the words "and multi-point calibrated device" from the title since that definition was being removed, and also recommended this item be designated as a Voting item.

Ms. Tina Butcher (NIST, OWM) recommended also including references to Sections 3.38., 3.39., and 5.58. to the bracketed portion of the definition, since the term "calibration parameter" also appears in those sections.

The Committee agreed with the recommendations heard at the open hearings and amended the proposal as shown in Item Under Consideration. The Committee further agreed to present the item for vote at the Annual Meeting.

2016 NCWM Annual Meeting:

At the 2016 NCWM Annual Meeting, Ms. Butcher (OWM) stated that OWM recommends the seven additional NIST Handbook 44 code references be added within the brackets associated with the definition of "calibration parameter" because the term currently appears in those codes and there have been no objections to including those references.

In consideration of Ms. Butcher's comments, the Committee agreed to present the item for vote unchanged.

Regional Association Comments:

The WWMA S&T Committee did not receive comments on this item during its open hearings at the 2015 WWMA Annual Meeting. The WWMA recommended that this item be an Information item.

The CWMA at both its 2015 Interim and 2016 Annual Meetings, recommended that this item be a Voting item on the NCWM agenda.

NEWMA reported at its 2015 Interim Meeting, it realizes that multi-point calibrations are not going away and need to be addressed; however, this item needs further work by the Committee to address concerns. NEWMA recommended that this item be an Information item. At its 2016 Annual Meeting, NEWMA recommended the item be forwarded to NCWM as a Voting item.

The SWMA reported at its 2015 Annual Meeting, it believes this item is ready if Items 330-3 and 331-4 are moved forward for Voting.

Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

360-5 D Appendix D – Definitions: Remote Configuration Capability

Source:
NIST Office of Weights and Measures (NIST, OWM)

Purpose:
Expand the scope of the definition for "remote configuration capability" to cover instances where the "other device," as noted in the current definition, may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:
This item is under development. Comments and inquiries may be directed to NIST Office of Weights and Measures.

A proposal to modify the definition for "remote configuration capability" as follows is under consideration:

> **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**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

Background/Discussion:
Removable digital storage devices can be used in Grain Moisture Meters (GMMs) as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability.

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

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

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

Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2011 meeting, Grain Analyzer Sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of NIST Handbook 44 should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of remote capability.
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

Because a change to the definition of remote configuration capability will apply to other device types, NIST OWM recommended that the changes to Table S.2.5., approved by the Sector in 2011, be separated into two independent proposals. One proposal would deal with the changes to Category 3 and its subcategories. The second would recommend a modification of the definition of "remote configuration capability" appearing in Appendix D of NIST Handbook 44 to recognize the expanded scope of remote capability; this proposal would be an alternative to adding a note to the bottom of Table S.2.5. to expand the definition for remote configuration for grain moisture meters (as shown in this proposal).

At its 2012 Meeting, the Grain Analyzer Sector agreed to separate its original proposal into two separate proposals and agreed to forward this proposal to change the definition of "remote configuration capability" to the S&T Committee for consideration. See also August 2012 NTEP Grain Analyzer Sector Summary, Item 5.

See the Committee's 2013, 2014, and 2015 Final Reports for additional background information and to review the different proposals considered by the Committee to address security of equipment; the metrological parameters of which can be changed by use of some form of removable digital storage device.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Ms. Tina Butcher (NIST, OWM) provided the following update on this item:

- Work on this item by members of OWM's Legal Metrology Devices Program (LMDP) is ongoing.
- The LMDP has not done further work on this item since the 2015 NCWM Annual Meeting, but anticipates resuming work in the spring of 2016.
- The LMDP has received feedback from the Measuring Sector and Regional Associations, which it will consider when developing any new revisions to the proposal.
- The LMDP hopes to be able to complete additional draft revisions and circulate them for consideration and feedback by the W&M Community by the 2016 NCWM Annual Meeting.
- As noted at the 2015 NCWM Annual Meeting, the LMDP plans to propose a new General Code requirement to address the sealing of equipment using this technology; this would allow the same "sealing requirement" to be applied to all the different device types that might use this technology.
- Some of the device codes in NIST Handbook 44 would need to be amended to exempt equipment adjusted using a removable digital storage device from having to comply with the current sealing requirements in those codes and to reference the proposed new General Code requirement.

- Although still in early draft form, members of the LMDP presented draft revisions for the General Code requirement and an example of a proposed change to the Scales Code at the 2015 NCWM Annual Meeting and would appreciate feedback from the weights and measures community as it continues to develop this item.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA reported that the SMA looks forward to the further clarification of this item. The SMA has concerns about changing metrological parameters without proper re-sealing.

The Committee believes this item has merit and needs further development. It looks forward to being able to consider a final proposal that addresses security of equipment using this type of technology.

2016 NCWM Annual Meeting:
At its 2016 NCWM Annual Meeting, the Committee heard an update on this item from Ms. Tina Butcher (NIDT, OWM). Ms. Butcher reported that OWM had not been able to further develop the item since the 2016 Interim Meeting of the NCWM, but hoped that it could find time in the coming months to finalize a proposal for consideration in the 2017 NCWM cycle. Ms. Butcher provided a brief summary of the work that had already been completed on this item by members of OWM's Legal Metrology Devices Program and requested the Committee maintain its Developing status on the item to allow time for OWM to finish this effort. She emphasized the need for there to be new sealing requirements developed for NIST Handbook 44 to address this technology (i.e., removable digital storage devices, which can change configuration and/or calibration parameters), noting that current sealing requirements never envisioned this technology. She reported that the Grain Sector was able to resolve its issue with respect to the sealing of grain equipment; however, the problem still exists with respect to other types of devices. She further stated that if OWM is unable to further develop this item such that a proposal can be presented for consideration at the 2017 NCWM Interim Meeting, OWM would request the item be Withdrawn.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported the SMA opposes the item. The SMA has concerns about changing sealable parameters without proper re-sealing.

In consideration of Ms. Butcher's request to maintain a Developing status to allow time for OWM to complete its work on the item, the Committee agreed to carry the item over on its agenda and to change the submitter from NTEP Grain Analyzer Sector to NIST OWM.

Regional Association Comments:
The WWMA, at its 2015 Annual Meeting, received comment from Ms. Tina Butcher, NIST, OWM, that work will continue on this item and proposed developing separate sealing requirements for other devices, which are adjusted using removable media. She recommended that this item be reassigned to NIST and retained it as a Developing item. The WWMA S&T Committee agrees with this request. The WWMA recommended that the item be a Developing item.

The CWMA, at its 2015 Interim Meeting, referenced concerns raised at the 2015 NCWM Interim meeting by NIST, OWM and recommended that this item remain a Developing item. At its 2016 Annual Meeting, the CWMA reported it feels this item has merit and the comments received were in support of it, but it needs development. The CWMA maintained its recommendation to the NCWM that the status of the item be kept as Developing.

NEWMA, at both its 2015 Interim and 2016 Annual Meetings recommended the item be forwarded to NCWM as a Developing item. OWM provided comments at NEWMA's 2016 Annual Meeting indicating work on the item by OWM was still ongoing.

At its 2015 Annual Meeting, the SWMA reported it understood NIST, OWM will take over the development of this item.

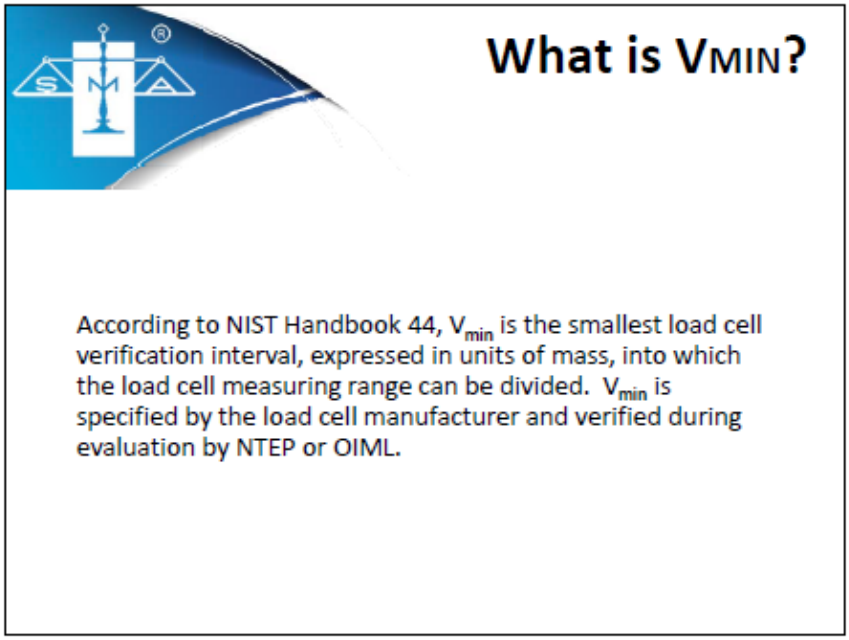
Additional letters, presentations, and data may have been part of the Committee's consideration. To review the supporting documentation, please refer to the "Report of the 100th National Conference on Weights and Measures" (SP1210, 2015).

Mr. Mahesh Albuquerque, Colorado | Committee Chair
Ms. Jane Zulkiewicz, Town of Barnstable, MA | Member
Dr. Matthew Curran, Florida | Member
Mr. Ivan Hankins, Iowa | Member
Ms. Rachelle Miller, Wisconsin | Member
Mr. Luciano Burtini, Measurement Canada | Canadian Technical Advisor
Mr. Rick Harshman, NIST, OWM | NIST Technical Advisor
Mr. Darrell Flocken, NCWM | NTEP Technical Advisor

Specifications & Tolerances Committee

Appendix A

Agenda Item 320-2: SMA's Presentation Slides – V_{min}



How do you know if the V_{MIN} is appropriate for the application?

S.5.4 of NIST Handbook 44 states:

For scales without a lever system:

$$Vmin \leq \frac{d}{\sqrt{N}}$$

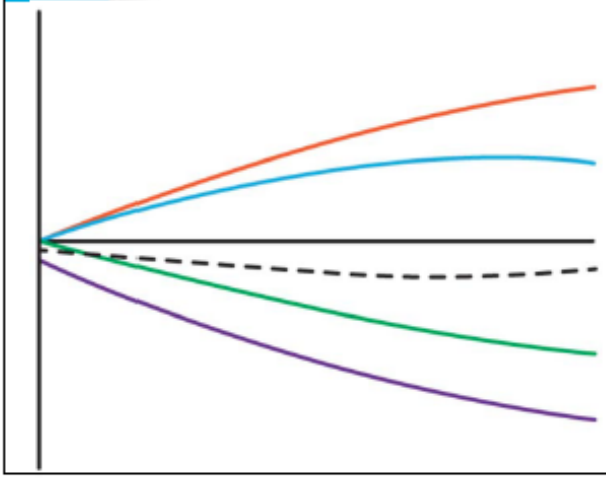
Where:

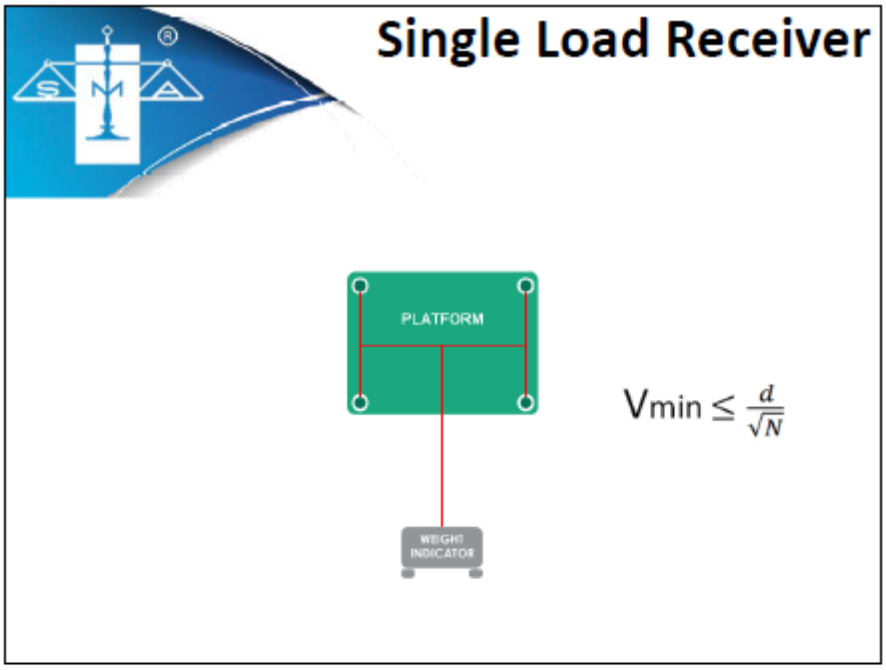
d = scale division

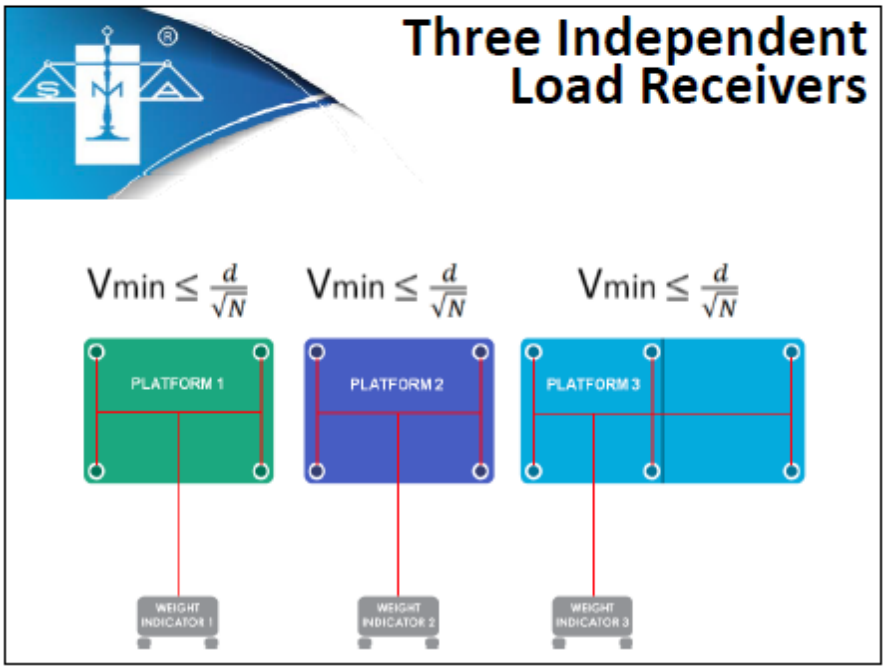
N = number of load cells

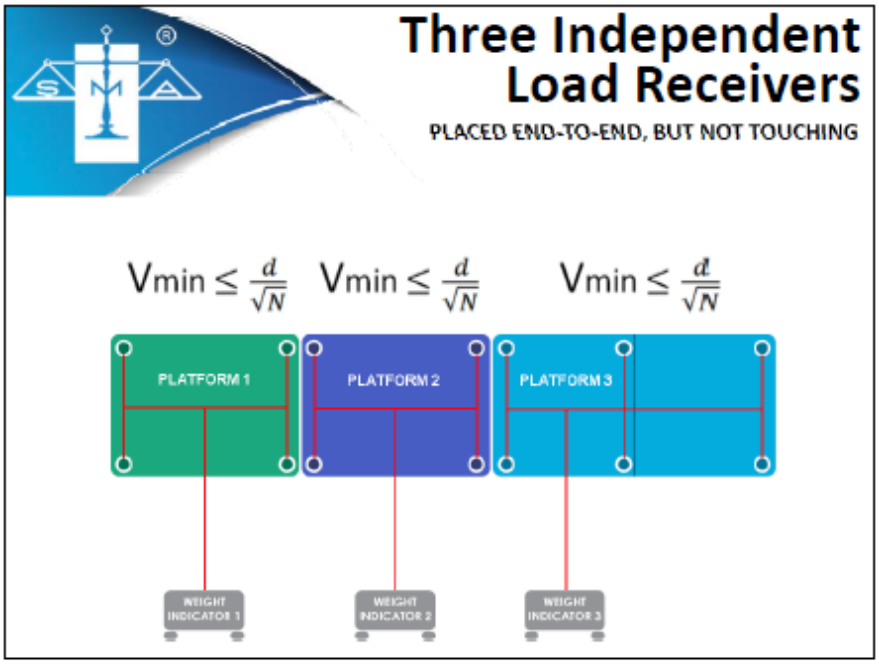
Load Cell Errors

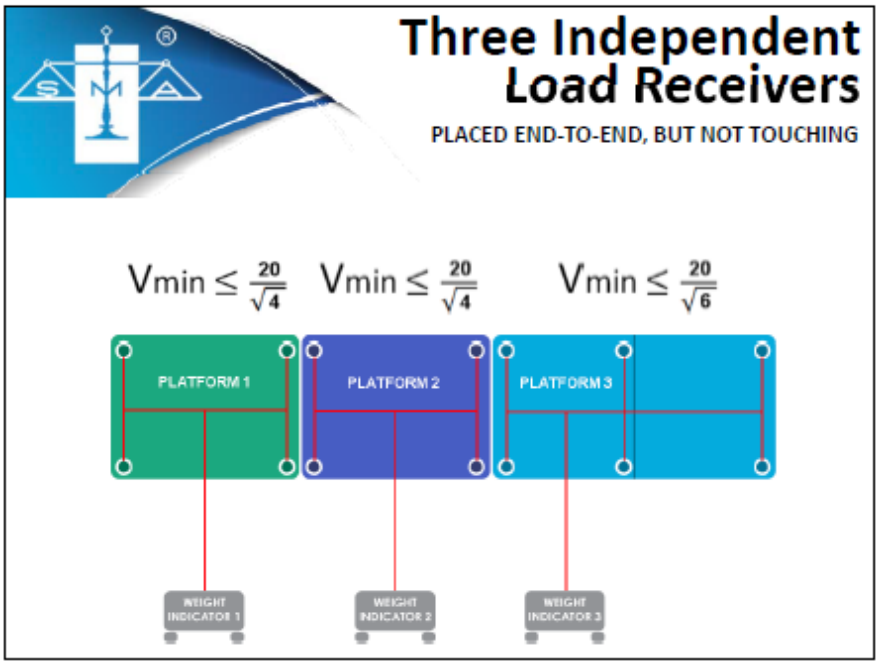
- Can be positive or negative
- Square root is used to address randomness of errors

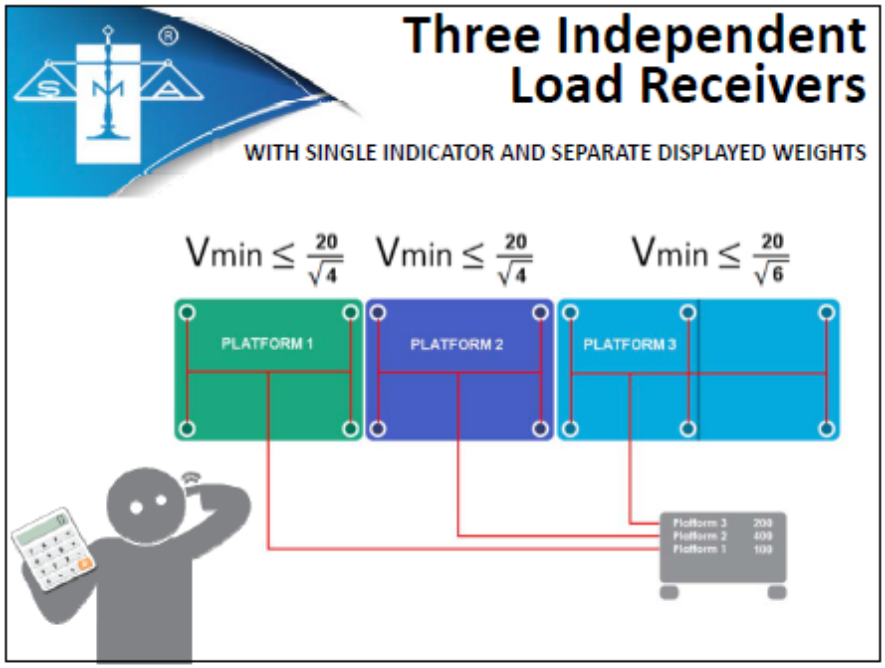


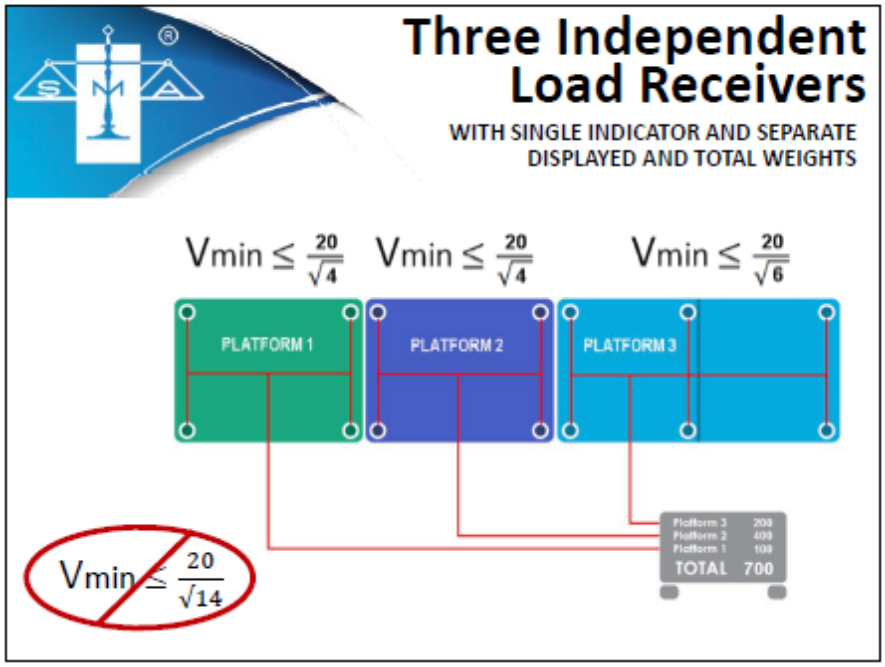












Total Weight Display

- Sum of individual load receiver weight readings.
- It is **NOT** a fourth scale.
- It has no measuring function in the calculation of the total weight. It is simply the mathematical summation and nothing else.
- Because there is no measurement function, there is no scale and therefore not subject to V_{MIN} requirements.

UR.3.3 Single-Draft Vehicle Weighing

A vehicle or a coupled-vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each of such vehicle or individual elements of such coupled combination. However, the weight of:

A. A coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results; or

B. A vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform.

Note: This paragraph does not apply to highway-law-enforcement scales and scales used for the collection of statistical data.
(Added 1992)

LOAD RECEIVERS COMMONLY FOUND IN COMMERCIAL VEHICLE WEIGHING AND OTHER APPLICATIONS:

- Have their own weight displays for each load receiver
- Each load receiver has its own unique serial number and security seal
- May have a single catalog number that lists the individual load receivers comprising the system
- Have a single total weight display that sums the individual load receiver weight displays
- Comply with T.N. 4.4. for Shift or Section Tests

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Appendix B

Rinstrum WIM Presentation

Rinstrum WIM Presentation

NCWM 2016 Interim Meeting

San Diego CA

rinstrum
SMART WEIGHING SOLUTIONS

WIM Axle Scale

axleWEIGH™

- WIM Axle Scale
- Operate at 1-3 miles per hour
- Patent pending design virtually eliminates mechanical noise from load introduction
- Self contained pre cast slab with integrated weigh bridge
- Factory adjusted and leveled to ensure smooth transition
- Installed on foundation of compacted crushed stone to help absorb vibration

rinstrum
SMART WEIGHING SOLUTIONS

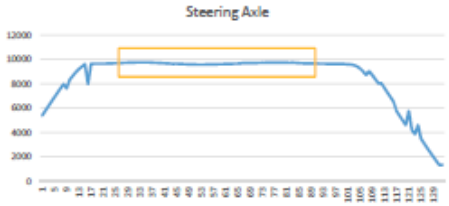
Why does it work?

- Load Cell mounting geometry virtually eliminates mechanical noise when transitioning on/off the scale
- No "opposite lifting effect" as found on traditional designs that place the load cells in each corner under the weighbridge
- The downward force is always inside the fulcrum point(s) for all cells
- The scale "acts" as if the load is static, when in fact it is dynamically rolling across the platform

NCWM 2016 Interim Meeting

rinstrum SMART WEIGHING SOLUTIONS

How Does It Work?



Samples	84
Average	9640
Max	9770
Min	9590
Speed	2.4
Variance	180

5385 5775 6150 6520 6890 7260 7620 7980 7620 8330 8650 8955 9215 9410 9620 7980 9640 9650 9640 9650 9660 9660 9670 9680 9690 9700 9710 9725 9735 9745 9755 9765 9770 9765 9760 9770 9740 9740 9715 9700 9685 9670 9660 9640 9660 9625 9625 9605 9590 9590 9595 9585 9595 9595 9590 9585 9610 9585 9610 9620 9635 9635 9645 9655 9665 9685 9715 9715 9715 9715 9715 9725 9740 9725 9745 9750 9750 9750 9750 9745 9745 9725 9745 9725 9700 9685 9685 9665 9670 9675 9675 9635 9630 9630 9640 9635 9640 9635 9640 9625 9610 9590 9540 9435 9265 9030 8730 9030 8730 8400 8045 8045 7665 7290 6910 6530 5755 5370 4985 4605 5755 4225 3855 4605 3480 3100 2730 2365 2010 1665 1325 1325

There is no special "magic" with this scale. The performance comes from reduction of mechanical noise resulting from a patent-pending load cell mounting geometry. Because the load cells work so well the controller has time and a high number of samples to average.

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rinstrum SMART WEIGHING SOLUTIONS

5 Consecutive Runs of the Same Vehicle

	Axle 1	Axle 2	Axle 3	Axle 4	Axle 5	Axle 6	GVW	Error
Run 1	9,640	16,000	15,600	12,560	12,580	11,780	78,160	+20 lbs.
Run 2	9,600	16,040	15,580	12,540	12,560	11,760	78,080	-60 lbs.
Run 3	9,640	16,000	15,560	12,560	12,600	11,800	78,160	+20 lbs.
Run 4	9,600	16,060	15,580	12,520	12,580	11,840	78,180	+40 lbs.
Run 5	9,620	16,040	15,580	12,500	12,560	11,860	78,160	+20 lbs.
Average	9,620	16,028	15,580	12,536	12,576	11,808		
Rounded	9,620	16,020	15,580	12,540	12,580	11,800		
Divisions	2	3	2	3	2	5		

Actual truck GVW as measured on a certified full length scale is 78,140 lbs.

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SMART WEIGHING SOLUTIONS

NIST Traceable Test Procedure

- Dynamically test with unloaded (empty) test truck
  - Make 3 or more runs across the scale between 1 and 3 MPH
  - All runs must be in the same direction
  - Minimize engine idling and distance driven between runs for fuel-load economy
  - Take an average of all runs and set that as the vehicle TARE weight
- Dynamically test with loaded test truck
  - Load test truck with a minimum of 21,000 lbs. of NIST traceable known weights
  - Make 3 or more runs across the scale between 1 and 3 MPH
  - All runs must be in the same direction as the test runs in step 1
  - Minimize engine idling and distance driven between runs for fuel-load economy
  - Take an average of all runs and set that as the vehicle GROSS weight
- Verify Tolerance
  - Calculate the NET weight by subtracting the TARE weight from the GROSS weight
  - The scale will PASS if the NET weight is within Class III L maintenance tolerance of the test load of NIST traceable known weights used in step 2
    - Class III L Maintenance tolerance at 21,000 test load is 3d or 60 lbs.
    - Pass criteria is only applied to NET weight vs. NIST test load

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Example of NIST Traceable Test Report

EXAMPLE: NIST Traceable Dynamic Test in 20 Lb. Graduations			
Vehicle Description	**Item**	**Displayed Reading**	**Tolerance**
Empty Test Truck	Run 1	28,360	-2d
	Run 2	28,440	+2d
	Run 3	28,420	+1
	Average	28,406	
	Calculated TARE (rounded)	**28,400**	
Loaded Test Truck with 21,000 lbs. Traceable Weights	Run 1	49,400	-1d
	Run 2	49,440	+1d
	Run 3	49,420	0d
	Average	49,420	
	Calculated GROSS (rounded)	**49,420**	
	Calculated NET Weight	**21,020**	+1d
	Test Load	21,000	PASS
	Variance	20 lbs.	

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We heard your feedback (and want more)

1. Provide data and test results supporting the accuracy claims
2. Improve the Test Procedure with direct traceability to NIST Standards
3. Seek guidance from a new WIM work group and Conference members
4. Consider putting the WIM legal-for-trade proposal in the Scales Code
5. Remove the Direct Law Enforcement application

NCWM 2016 Interim Meeting

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Appendix C

(Draft) Guidance on Empirical Analysis

This guide is intended for:

- Service agents acting under the auspices of their local regulatory authority, who are calibrating or placing meters into service with multiple linearization factors;
- Regulatory officials who witness the calibration or placing-in-service of meters with multiple linearization factors;
- Regulatory officials and service agents who are verifying the accuracy of meters with multiple linearization factors.

In theory, any properly performing meter system should be able to be calibrated with one calibration setting and remain in tolerance at any flow rate for one product, or group of similar products. Meter systems with mechanical calibrators operate in this manner. They have one calibration setting and are limited to dispensing only one product or one group of similar products. Accuracy is typically optimized at the normal flow rate for the most frequently dispensed product. This usually means there are slight errors at other flow rates, and for other products. These errors should be of no concern to the regulatory official if they are within applicable tolerances, but the device owner may wish to reduce these inaccuracies.

Modern meter registration technology allows accuracy to be optimized for multiple products at multiple flow rates through the use of linearization factors. Establishing, maintaining, and verifying these linearization factors can be time-consuming, however, because meter performance can be affected by system configurations. Differences in product density and viscosity can affect meter performance. Differences in storage tank size, location and plumbing configurations upstream of the meter may also affect meter technologies sensitive to flow profile configurations.

Device owners must weigh the benefits of optimization against the time commitment necessary to establish and maintain multiple linearization factors. It is the device owner's prerogative to determine whether each meter will be programmed with multiple flow rates and factors for each product, or with just one factor regardless of flow rate and product. If a meter is configured with only one linearization factor, it should be calibrated and verified exactly like a meter with a mechanical calibrator and register.

Meters with multiple linearization factors must initially be physically tested on each non-identical product at each configured flow rate in order to characterize the system and to determine the appropriate linearization factors. Using this initial data, regulatory officials can then determine which products can be treated as if they were identical and which as similar or discreet. The regulatory official may then also decide if and when empirical analysis may be used in conjunction with physical testing to reduce the time burden on subsequent calibrations and verifications.

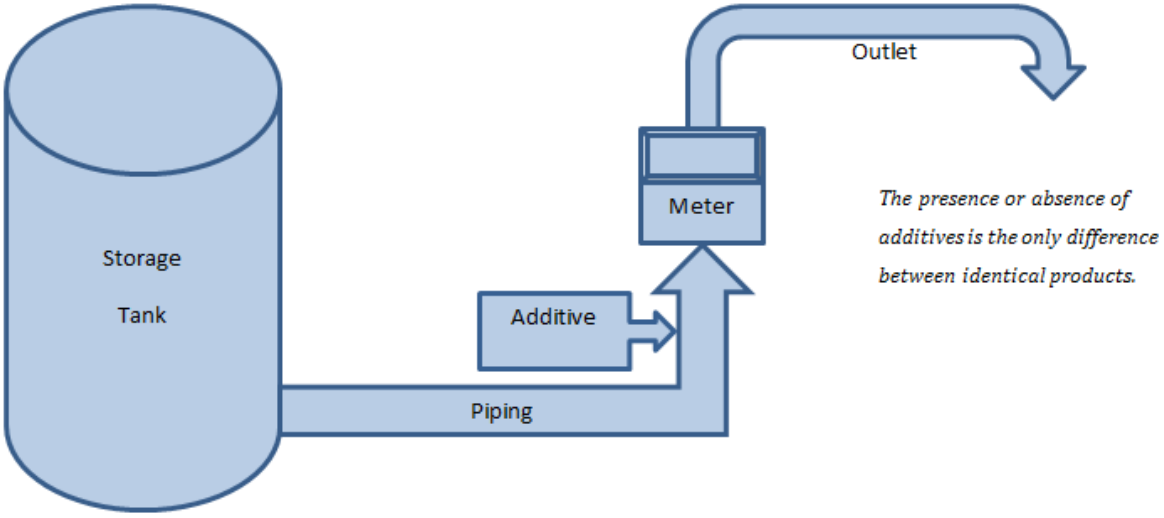
The purpose of this guidance is to aid regulatory officials (and service agents acting under the auspices of their local regulatory authorities) in determining how and when empirical analysis can be properly utilized.

INITIAL TESTING - IDENTICAL VS SIMILAR VS DISCREET PRODUCTS

Products are considered identical when:

- The base product is the same; and
- The base product flows from the same storage tank; and
- The base product uses the same piping; and

- Any differences are due only to the injection of octane enhancer or corrosion inhibiters, dye, or similar additives that do not significantly change the product's properties.



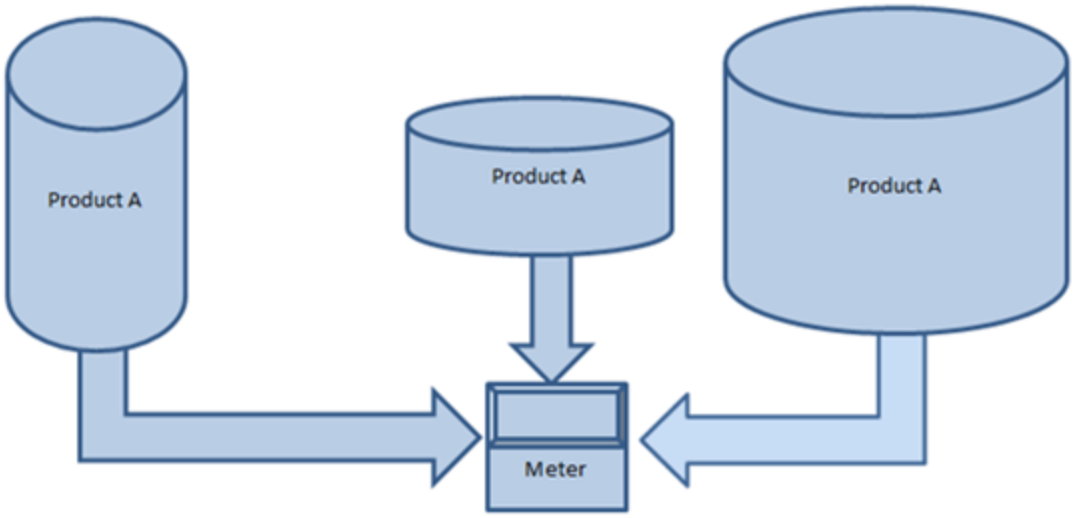
Identical products should be configured identically. Flow rates, and linearization factors at each flow rate, should be identical. Initially, only one product in a group of identical products needs to be physically tested, but it should be tested at all flow rates for which the meter is configured. On subsequent verifications, some of the flow rates may be verified empirically at the discretion of the regulatory official.

Consider, for example, a terminal meter which delivers taxed (clear) and untaxed (dyed) #2 diesel, drawn from the same tank, and delivered through the same piping. The red dye for the untaxed diesel is injected at the rack and there are no other differences between the products other than the dye. The meter is configured with the same slow flow rate, high flow rate, and intermediate flow rate for both products. It would be appropriate to physically test only the clear diesel on initial inspection at all three flow rates. The linearization factors for the dyed product should be the same as the linearization factors of the clear product. If any adjustments were made to the clear product's linearization factors, the same adjustments should be made to the dyed products factors.

At future inspections, the regulatory official may decide that the clear diesel will be physically tested at high and low flow rate rates, and its linearization factor will be empirically verified at the intermediate flow rate. The dyed diesel will always be empirically compared to the clear diesel, and its linearization factors will always match those of the clear.

Products are considered similar when:

- They are the same grade of product but flow from different storage tanks; or
- They are the same grade of product but they reach the meter through different piping; or
- They are different products listed in the same Product Family on the meter's NTEP Certificate of Conformance, and they differ by –
  - No more than 10% in viscosity (for positive displacement, turbine and similar meters); or
  - No more than 10% in specific gravity (for mass flow meters).



The size and shape of storage tanks, the horse power of different pumps, and the length and configuration of the plumbing, can affect the performance of some meters. Initial testing is needed to determine if the same product coming from different tanks can be considered to be similar, or if the product in each tank must be treated as if it was discreet.

Initial physical testing of the meter should be done with all non-identical products at all flow rates. The official with regulatory authority will use the initial test data to determine whether similar products can be treated as if they were identical on subsequent verifications and calibrations.

Initial data may show that the meter performs as if some products were identical. For example, different batches of gasoline with the same octane but drawn from different tanks may have identical linearization factors at every flow rate. Such products can be treated as if they are identical. [Note: Some meter technologies are sensitive to upstream flow dynamics caused by environmental factors like pump horse power, tank shape and size, or plumbing configurations. Do not assume that the meter will perform identically with product of the same grade from different tanks. Verify through physical testing before making that determination.] Similar products which can be treated as if they were identical should be configured with the same flow rates and identical factors at each flow rate. Only one product in the group needs to undergo physical testing on subsequent verifications. Any adjustments made to the product being physically tested should be made to the other products in the group.

Initial testing may show that some products have optimal linearization factors which are not the same, but which are so close that the products can be treated as if they were identical. For example, consider a terminal meter which delivers sub-grade, mid-grade, and premium gasoline. Initial physical testing shows that the maximum difference between their optimal linearization factors at any flow rate is less than 0.05 %. (One quarter of acceptance tolerance)

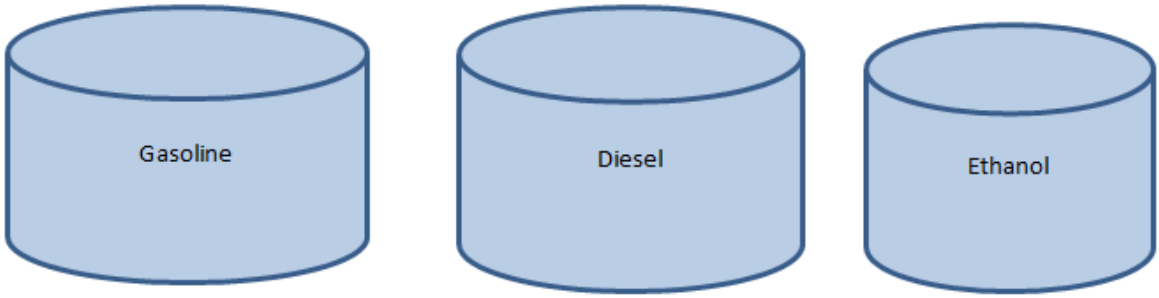
If the owner prefers to save time on subsequent verifications, the regulatory official would be justified in allowing the high and low factors to be averaged for every flow rate, and those factors to be input for all three products. These products could be treated as if they were identical on subsequent verifications. Only the intermediate product in the group would need to undergo physical testing on subsequent verifications. Any adjustments made to the product being physically tested should be made to the other products in the group.

If, however, the owner prefers to optimize accuracy and accepts that more physical testing will be required, each product can utilize its optimal linearization factor at each flow rate. The regulatory official must then determine if

physical testing will be required for all products at all flow rates, or some combination of physical and empirical testing will be allowed.

Products are considered discreet when:

- They meet the criteria of similar products except that their optimal linearization factors differ from those of other products so much that they could not utilize the same factor as another product and still be in tolerance; or
- They are listed in the different Product Families on the meter's NTEP Certificate of Conformance; or
- They are different products listed in the same Product Family on the meter's NTEP Certificate of Conformance, and they differ by –
    - More than 10 % in viscosity (for positive displacement, turbine and similar meters); or
    - More than 10 % in specific gravity (for mass flow meters).



Discreet products are from different product families as listed on the NTEP certificate, are from the same product family but they differ by more than 10% in viscosity or specific gravity, or are similar but initial testing has determined that they cannot use the same linearization factors and still be in tolerance.

An example of a discreet product would be ethanol dispensed through a meter that is also configured to dispense various grades of gasoline. Discreet products must always be physically tested at all flow rates initially. Regulatory officials may decide to allow empirical analysis on some flow rates during subsequent verifications.

Empirical Analysis

Based on data analysis of the initial testing, the official with regulatory authority will determine if and when empirical analysis can be used on subsequent tests.

Acceptable Methods of Empirical Analysis

1. Evaluation between linearization factors on the same product, or identical products.

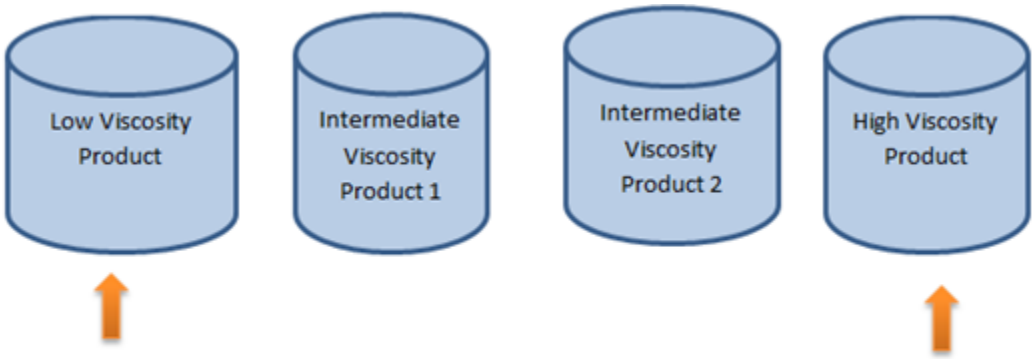
   A product with unique linearization factors at different flow rates should not have linearization factors which are significantly different from adjacent factors. The regulatory official does not have to conduct physical testing at every flow rate, but should test the high and low flow rates at a minimum. The official can review the factors for flow rates which were not tested. Most meters have calibration curves which are roughly (not exactly) linear, so any factor which stands out as abnormally high or low should be physically verified. Identical products should always have identical factors at every flow rate.

Test the slow flow rate first, and then the high flow rate. The factors fo the middle flow rates should be between the factors fo the high and low flow rates. The factors should be roughly linear.

2. Evaluation between linearization factors on a group of similar products.

   If a group of similar products all have the same linearization factors, testing the highest and lowest viscosity products should be enough to determine whether the intermediate viscosity products will be in tolerance or not.

   If the similar products have different factors, test the high and low viscosity products. The linearization factors of the intermediate products should fall between the linearization factors for the two extreme products in a progression that mirrors the relation to the viscosities of the high/low viscosity products.



Test the highest and lowest viscosity products, and then evaluate the linearization factors of the intermediate products. All products should have the same linearization factors at every configured flow rate, or the intermediate products should have factors which fall between the factors of the high and low viscosity products.

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Report of the Professional Development Committee (PDC)

Angela Godwin, Committee Chair
Ventura County, California

400 INTRODUCTION

This is the final report of the Professional Development Committee (PDC) (hereinafter referred to as the "Committee") for the 101st Annual Meeting of the National Conference on Weights and Measures (NCWM) held in Denver Colorado, July 24 - 28, 2016. This report is based on the Interim Report offered in the NCWM Publication 16, "Committee Reports," testimony at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The Informational items shown below were adopted as presented when this report was approved.

Table A identifies the agenda items by reference key, title of item, page number and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of an item's reference key are assigned from the Subject Series List The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered individually; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee will entertain any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), and 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**). When used in this report, the term "weight" means "mass".

Note: The policy is to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to U.S. customary units.

Subject Series List

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ADDIE	Analysis, Design, Development, Implementation, and Evaluation	NEWMA	Northeastern Weights and Measures Association
ANSI	American National Standards Institute	NIST	National Institute of Standards and Technology
BOK	Body of Knowledge	OWM	Office of Weights and Measures
CWMA	Central Weights and Measures Association	PDC	Professional Development Committee
ISO	International Standardization Organization	RSA	Registered Service Agents
ICE	Institute for Credentialing Excellence	SME	Subject Matter Expert
NCWM	National Conference on Weights and Measures	SWMA	Southern Weights and Measures Association
		WWMA	Western Weights and Measures Association

Table C
Voting Table

Reference Key Number	***Houe of State Representatives***		***House of Delegates***		***Results***
	Yeas	***Nays***	***Yeas***	***Nays***	
To accept the Report	Voice Vote				Adopted

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Details of All Items
(In order by Reference Key)

410 EDUCATION

410-1 I Professional Certification Program

Professional certifications are offered in many industries as a means of demonstrating competence in a particular field of expertise. Certification may be a means of qualifying an individual for employment or a higher pay grade within a profession. The National Conference on Weights and Measures (NCWM) Professional Certification Program provides confidence that an individual has a strong understanding of U.S. weights and measures standards as adopted by NCWM and published in National Institute of Standards and Techology (NIST) Handbook 44 "Specifications, Tolerance, and Other Technical Requirements for Weighing and Measuring Devices," NIST Handbook 130, "Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality," and NIST Handbook 133, "Checking the Net Content of Packaged Goods."

Professional certification is available to NCWM members and non-members in the private sector and in government positions. Please note that the person taking the test must be an NCWM member in order to take the exams for free.

Three new Professional Certification exams were deployed in 2015. These include Medium Capacity Scales, Large Capacity Scales, and Vehicle-Tank Meters. The next exams to be completed will be Liquefied Petroleum Gas (LPG) and Price Verification, followed by Mass Flow Meters, Packaging and Labeling, and Precision Scales. Work has begun on the LPG exam and the Price Verification exam. The PDC is still looking for additional subject mater expert (SME) volunteers for both of these projects. Any interested parties should contact Mr. Andersen through the NCWM Headquarters at **info@ncwm.net**. The SME volunteers are the real heart of the certification program. The successful creation of these exams is dependent on willing volunteers.

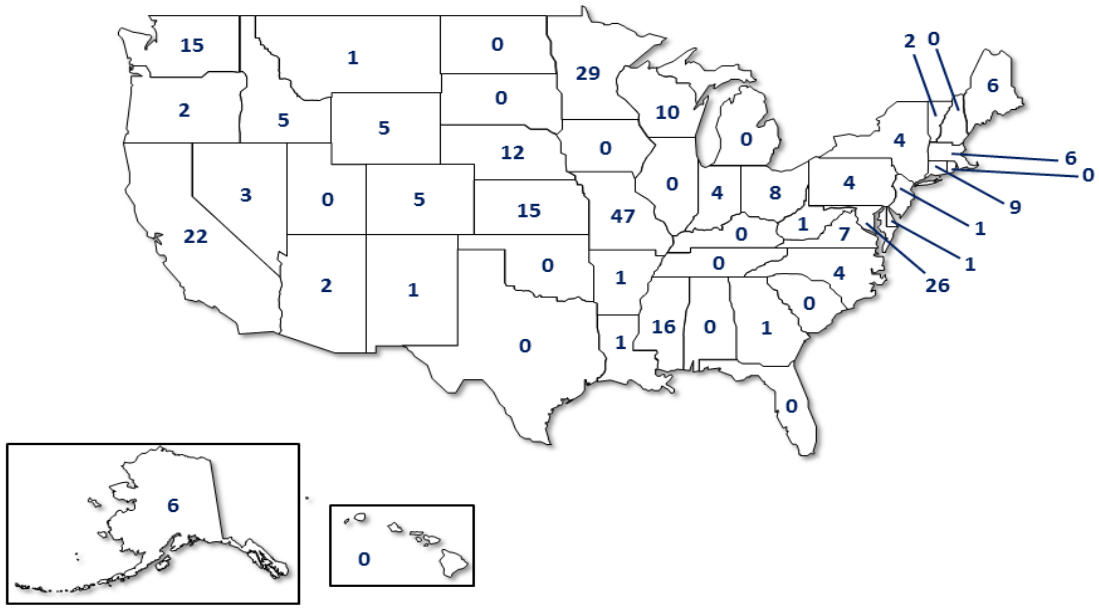
Status of Current Tests
The NCWM has issued 310 professional certificates from inception of the Professional Certification Program to September 30, 2015. Of the certificates issued, six have been issued to individuals in the private sector (three for small scales, two for package checking, and one for retail motor-fuel dispensers). The balance of the certificates has been issued to regulators in 30 different states.

Number of Certificates NCWM Has Issued as of the End of Fiscal Year 2015 (September 30th)					
	FY10-11	**FY11-12**	**FY12-13**	**FY13-14**	**FY14-15**
Count in Year	44	94	106	70	186
Cumulative	44	138	244	314	500

Certification (posted)	Certificates
RMFD (5/2010)	230
Small Scales (8/2012)	131
Package Checking (8/2012)	78
Medium-Capacity Scales (4/2015)	30
Large-Capacity Scales (4/2015)	11
Vehicle-Tank Meters (4/2015)	20

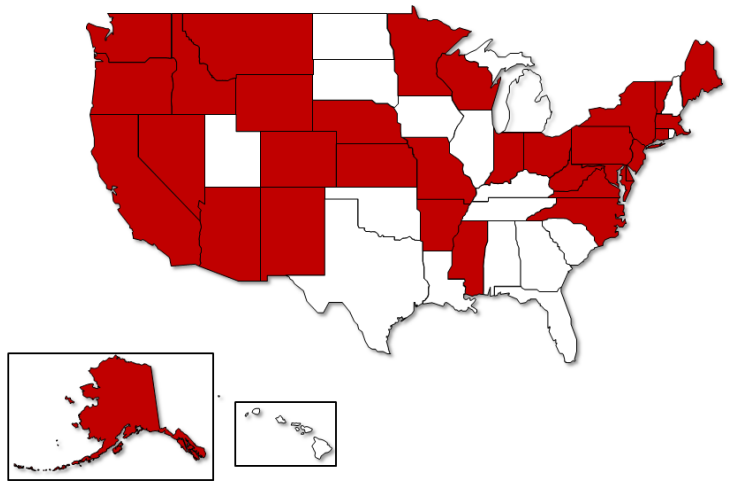
The following map includes 36 states with individuals holding a certificate in one or more disciplines. In addition to those certificates shown on the map, there are six certificates issued to private sector personnel.

Distribution of Certified Professionals per State
Updated: September 2015

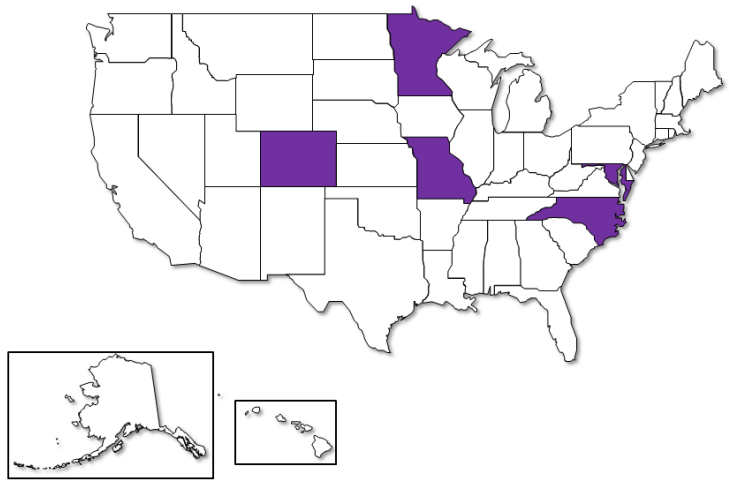


States with Largest Numbers of Certificates			
State	**Certificates**	**State**	**Certificates**
Missouri	90	Mississippi	15
Minnesota	83	Connecticut	15
Maryland	57	Virginia	14
Nebraska	30	Kansas	13
Washington	24	Alaska	11
Wisconsin	22	Maine	10
California	21		

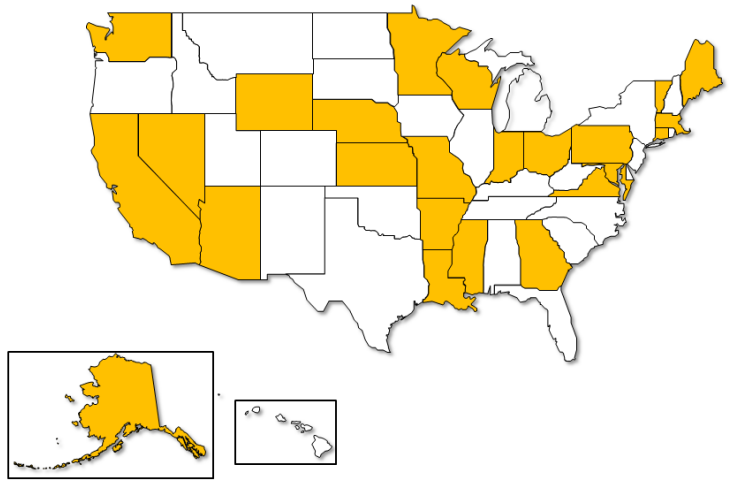
Distribution of Areas of Certification:
Retail Motor-Fuel Dispensing Systems
Updated: September 2015

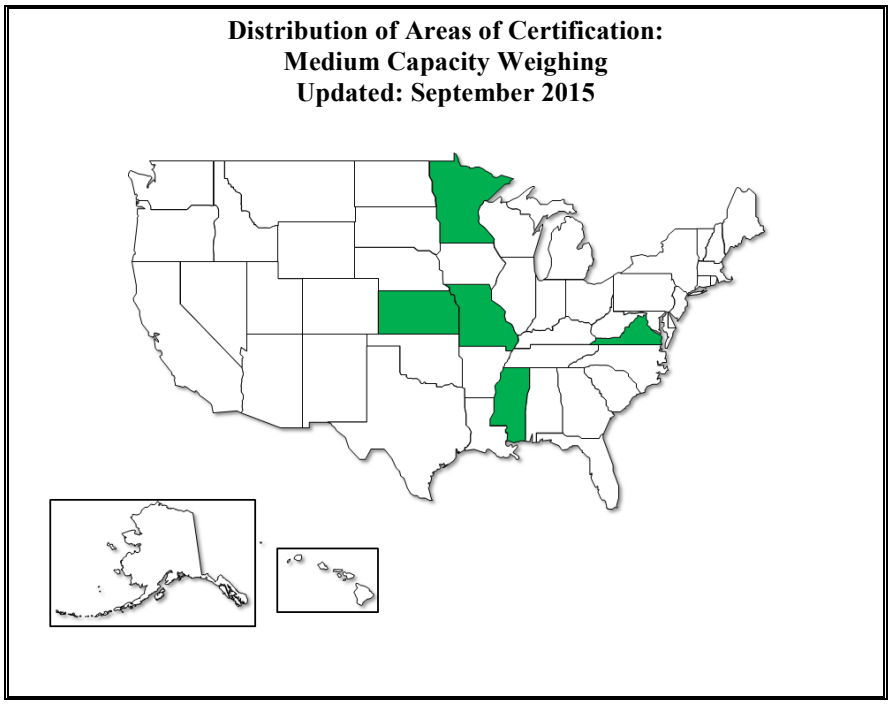


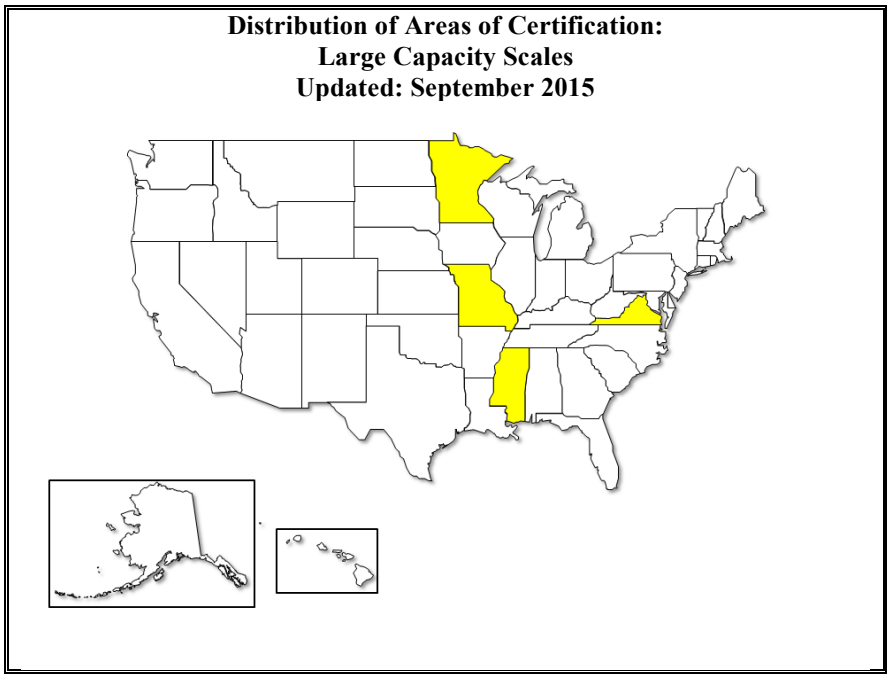
Distribution of Areas of Certification:
Vehicle-Tank Meters
Updated: September 2015



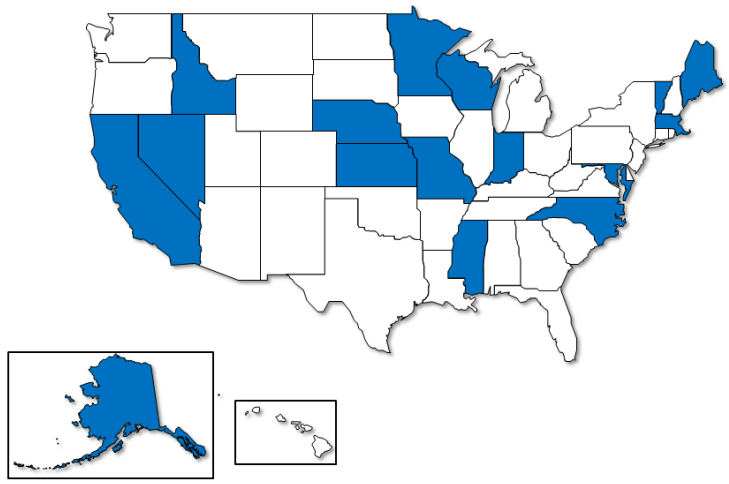
Distribution of Areas of Certification:
Small Capacity Weighing Systems, Class III
Updated: September 2015







Distribution of Areas of Certification:
Package Checking, Basic
Updated: September 2015



The Committee continually works to improve the exams and the exam experience. A key goal is to make sure the exams stay meaningful and current as handbook changes are made. This includes an annual review of the current exams by the Certification Coordinator. A short entry survey is being added to each exam to capture meta-data on who is taking the exams. Examples of meta-data include the candidate's level of experience; whether the candidate is a regulatory official or a service agent; and so forth. The questions are in an untimed, unscored portion of the exam. Personal data will not be used in any analysis of the survey information.

In order to obtain valuable feedback on the Certification Program, the Committee has begun work on an exit survey, which will be implemented using Survey Monkey. The questions on the survey will address the mechanics of taking the exam, preparation for taking the exam, and general feedback (e.g., How did the candidate react to the content of the exam? Was it challenging? Was it too easy? Did the candidate feel the exam was fair?).

At the 2015 Interim Meeting, the Committee was asked to discuss and/or further develop multiple areas of the Certification program, including Accreditation; Proctoring Exams; Examination Protocol; and Intermediate Exams. At the 2015 Annual Meeting, the NCWM Board of Directors asked the Committee to explore the concept of basic competency exams. The Board also asked the Committee to consider whether there should be a distinction between exams for weights and measures officials vs. service personnel, and, if so, how to delineate between the exams.

Following the Annual Meeting, the Committee developed criteria for proctoring to meet accreditation requirements. Additionally, the PDC developed learning objectives to support basic competency exams for service agents and officials.

The Committee received multiple comments from the fall 2015 regional weights and measures association meetings. All four regional associations continue to express support for the certification program and support maintaining this item as an "Information" item on the Committee's agenda.

The WWMA PDC reported hearing support from multiple jurisdictions regarding offering exams to service companies. Some jurisdictions felt there should be a distinction between the exams offered to service companies and those offered to officials. The WWMA heard from one industry member who expressed concern regarding any requirement for service companies to take tests when only a small number of officials have completed these exams. Others commented were should be language noting that there may be additional local requirements that would apply to service agents and suggested establishing links to state Registered Service Agent programs on the NCWM site. The WWMA continues to encourage more regulatory officials to take the exams, and noted that more regulatory officials might take the exams if the fee for non-NCWM members was waived either temporarily or indefinitely.

With regard to the idea of proctoring exams, the CWMA agreed this is a good way to protect the integrity of the testing process, but questioned if traveling to central locations to take tests might discourage participation by some candidates.

Some CWMA members questioned whether additional time might be allowed for completing an exam as a means to help alleviate some anxiety for candidates, thereby, increasing the likelihood of success. The CWMA also felt there is a need for a "cooling off" period between testing attempts; especially following a second failed attempt. There was no consensus on a recommended time frame.

Some questions were raised at the CWMA regarding scoring on the medium-capacity scales exam; the commenter was to follow up with the NCWM to address these questions so that it could be determined if problems exist.

At the 2016 Interim Meeting, the PDC met with the Board of Directors to confirm that the direction and priorities of this work was consistent with the Board's expectations. During its working sessions prior to and during this meeting as well as discussions with the Board, the Committee has discussed possible ways in which proctoring of exams might be accomplished, including the use of independent proctoring services or the use of supervisory staff within weights and measures jurisdictions or other neutral individuals within those agencies. Some Committee members report that independent proctoring services may offer a wide number of locations in which testing can be offered, possibly providing an even wider choice of locations than might be practical through a weights and measures jurisdiction. The Committee will continue to explore the issue of proctoring exams and welcomes ideas and input from the community.

At its open hearings, the Committee asked NCWM members for feedback on the current Professional Certification exams. Multiple states commented that they use the existing exams to assess competency levels of staff members; identify gaps in performance; assess the effectiveness of training provided; and encourage the personal professional development of their staff. Julie Quinn (Minnesota) further noted that the exams are challenging and the candidates who successfully complete the professional certification exams feel a sense of professional pride and accomplishment.

The PDC presented the concept of new exams (which include a NIST Handbook 44 component and a device component) in the following areas:

- Basic Service Agent Competency – Weighing Devices
- Basic Service Agent Competency – Liquid Measuring Devices
- Basic Regulatory Official Competency – Weighing Devices
- Basic Regulatory Official Competency – Liquid Measuring Devices

The Committee asked NCWM members for input on the following questions:

1. For those states that license service agents would the Service Agent Basic Competency Exam be of value in the licensing process?
2. For states and other jurisdictions would the Basic Regulatory Official Competency Exams be of value in evaluating the effectiveness of training?

Many states spoke in support of the development of basic competency exams. Several states noted that they could use these exams for service agents as well as entry level officials.

During its working session, the Committee noted that the basic competency exams will only cover very general objectives in the weighing or measuring area. The Committee acknowledged comments from some weights and

measures directors indicating that there may be a need for additional, more specific exams to demonstrate competency of service agents in focused topic areas. For example, a jurisdiction may want some evidence that a service agent who is going to be servicing LPG metering systems has demonstrated competence in that specific area, rather than just in the basic competency area of measuring devices. The Committee will continue to develop the concept of these basic exams while continuing to expand the Professional Certification Program to include new topic areas. The Committee appreciates and looks forward to continued input on both the Professional Certification exams as well as other exams that might be used to demonstrate lower levels of competency.

At its 2016 Annual Meeting, NEWMA heard several comments that states were interested in the basic competency exams and want to know what is going to be included on the exams. An industry representative was interested in having national basic competency exams that would be recognized across the country since it would help service companies that do business in several states. A member also questioned if the PDC was considering making the basic competency exams a prerequisite to taking the Professional Certification Exam.

At its 2016 Annual Meeting, the CWMA heard comments from attendees noting the need for testing to address the basic competencies needed by the service person and the regulatory official. The CWMA recognized that the basic competencies for both groups are identical. The consensus of CWMA members (15 for, 2 against) was to have one test on basic competencies to be used for both groups. Members commented that additional questions can be crafted to address differences between the two groups. Most important is that all have a basic understanding of NIST Handbook 44 and its application.

Several CWMA members expressed concern over the lack of feedback for the test taker with regard to areas that were answered incorrectly on the test. It is not necessary for the test taker to know the specific question(s) missed; however, the test taker needs information regarding the general principles that were missed. Learning is best done by addressing and correcting mistakes, and without feedback on areas answered incorrectly, there is no opportunity to correct the learning deficiency. Since test questions are tied to specific handbook references, it was suggested the NCWM PDC explore the possibility of infoming the test taker of the individual areas for review without revealing the exact question(s) missed.

Since the 2016 Interim Meeting, the Committee has worked with the Board regarding the direction for the basic competency exams. At the 2016 Annual Meeting, the Committee reported that two exams will be developed: Basic Weighing and Basic Liquid Measuring. The Committee plans for each exam to include two parts; each exam will include a total of thirty questions and participants will be allotted a one-hour time limit for the exam. Part one of the Weighing Exam will include questions on the General Code in NIST Handbook 44 and part two will include general questions on weighing devices covered in the Scales Code. Part one of the liquid-measuring exam will include questions on the General Code in NIST Handbook 44 and part two will include general questions on liquid-measuring devices covered in the Liquid-Measuring Devices Code, the Vehicle-Tank Meters Code, and the Mass Flow Meters Code.

The modules containing the learning objectives have been drafted for both exams and will be posted to the NCWM Web site shortly. The Committee plans to send copies of the modules to state directors with a very brief survey. The Committee is primarily interested in knowing if state directors would use exams in evaluating the training progress of their staff and if they would used the exams in the licensing of service agents in their states. The survey will also request feedback on whether the learning objectives are appropriate for basic competency of weights and measures officials and service personnel.

410-2 I Training

The purpose of this item is to share best practices and approaches to training in response to the broad training needs of weights and measures jurisdictions and to serve as a link to various training materials on the web.

At the 2014 Annual Meeting, the Committee announced that the NCWM Model Field Training Program, developed by a subcommittee chaired by Mr. Michael Cleary (California, retired), is available for use. During the remainder of 2014 and in 2015, Mr. Cleary provided instruction on the use of the program at multiple regional weights and measures association meetings, thanks to support from the Associate Membership. At the 2015 Annual Meeting, Mr. Cleary

spoke about the training he provided at the regional meetings and stated that his PowerPoint presentation from the CWMA meeting is available on the NCWM Web site at **http://www.ncwm.net/training/model_training**. The Committee acknowledged the positive feedback received on the program and expressed appreciation to Mr. Cleary and the subcommittee members. As feedback has been received on the model program, minor changes have been made and the updated document can be found under the training section of the NCWM Web site through the Resources tab. If you have any suggestions or recommendations or if you need support for successful implementation, please contact a member of the PDC.

At the 2015 Interim and Annual Meetings, Ms. Tina Butcher (NIST Office of Weights and Measures [OWM]) reported that a training video on retail motor-fuel dispensers (RMFDs) was released by the NIST OWM in fall 2014 and work is underway on a similar video for small capacity scales. The RMFD video demonstrates and provides an overview of the inspection and testing of an RMFD for compliance with NIST Handbook 44. It includes how to select and maintain a standard, wet the standard, conduct normal and slow flow tests, and information on leveling, reading the meniscus, draining a test measure, and conducting the anti-drain test. The video is available in a 14-minute video segment or it may be viewed in individual segments. The video can be accessed from OWM's home page at: **http://www.nist.gov/pml/wmd/index.cfm**. Select the "Legal Metrology Devices" link under "Programs." On the "Legal Metrology Devices Program" page, click on "Training Materials" under "Related Links." A NIST Handbook 44 Self-Study Course is also accessible on the "Training Materials" page.

At their fall 2015 meetings, all four regional weights and measures associations supported maintaining this item as an "Informational" item on the Committee's agenda. The WWMA expressed continued support for the NCWM Model Field Training Program for use in training new officials as well as continued development of training videos by NIST. NEWMA expressed appreciation for the NIST videos and continued development and some NEWMA members reported using the video during training events.

During open hearings at the 2016 Interim Meeting, Mr. Stacey Carlsen (Marin County, California) commented he is encouraged to see how the sustained collaboration among the states, the PDC, and NIST, OWM continues to strengthen the foundation for professional development in the weights and measures community. Ms. Butcher (NIST, OWM) reported that NIST continues to develop a video on small capacity scales (similar to the previously referenced one for RMFDs) and expects to have that available on its Web site later in 2016.

During NEWMA's 2016 Annual Meeting, NIST, OWM commented that they are honoring current commitments for training, but it will take more lead time in the future to get a NIST trainer due to staffing shortages. NIST will continue to provide OWM training materials to anyone interested in doing their own training.

At its 2016 Annual Meeting, the CWMA expressed thanks to NIST for providing training on retail motor-fuel dispensers concurrently with its 2016 Annual Meeting. CWMA members suggested that training for the 2017 CWMA Annual Meeting cover medium capacity scales.

At the 2016 NCWM Annual Meeting, the Committee heard an update on NIST, OWM Training provided over the past 12 months. Mrs. Butcher (NIST, OWM) noted that OWM provided 47 classes in the past 12 months, resulting in the awarding of more than 1340 Continuing Education Units (CEUs). These classes involved both public and private sector participants (including other countries in Inter-American Metrology System [SIM]) and focused on the following areas.

- Laboratory Metrology (More than 470 students participated)
  - Seminars on Fundamentals on Mass and Volume Metrology and Lab Administration
  - Webinars for students from state and industry metrology laboratories on subjects such as document control, contract review, and procedures for documenting traceability and calibration intervals

- Weighing and Measuring Devices
  - Seminar in North Carolina on LPG Liquid-Measuring Systems (22 students from 13 states)
  - Seminar in South Dakota (held concurrently with the CWMA) on Retail Motor-Fuel Dispensers (24 students from 10 states)
  - Webinars on Pour and Drain Procedures (27 students from 16 states)

- Package Control
  - Seminars in Nevada, California, Texas, Nebraska, Kentucky and Other States on inspection of packages for accurate labeling and net weight (105 students)
  - Seminar in Nevada on Price Verification procedures in retail stores (19 students)

Ms. Butcher also reported that the following OWM training is scheduled for the remainder of 2016:

- August 2016 – NIST Trainer Seminar – packaging
- October 2016 – Liquefied Petroleum Gas Liquid-Measuring Systems (Alaska)
- October 2016 – Compressed Natural Gas Metering Systems (Utah)*

**Editor's Note: This training on CNG Metering Systems has since been delayed to spring 2017 at the request of the host jurisdiction.*

410-3 I Instructor Improvement

NIST OWM has provided legal metrology training for weights and measures jurisdictions and industry for many years, but does not have the resources to respond to the numerous training requests it receives. OWM has long recognized that there are many individuals with extensive legal metrology experience who have the skills needed to provide this type of training, and, in some cases, those individuals are already training within their own jurisdictions or regions. Drawing from this pool of individuals, OWM hopes to develop trainers who can present schools on behalf of NIST, thus, leveraging NIST resources; providing access to NIST training on a timetable that can meet jurisdictions' needs; and providing a way to more broadly share the valuable expertise these individuals possess.

Several years ago, OWM renewed its efforts to develop trainers by providing a grant to the NCWM that is intended to pay travel costs of individuals to travel within their regions to conduct training and to participate in NIST training for trainers. This partnership has enabled NIST to bring in candidates for NIST-sponsored training such as "train the trainer" classes and to participate in NIST technical training schools. Through an application process, in collaboration with weights and measures directors and nominated training candidates, NIST has identified a group of people who are now working with NIST to develop the knowledge, skills, and abilities to present specific technical schools on behalf of NIST. Candidates not only participate in "train the trainer" seminars, but also work with NIST staff to participate in technical training schools, assist in teaching seminars, and to develop materials for use in NIST training schools.

NIST training seminars on field inspection topics are only held a limited number of times each year. This poses a challenge in sustaining regular interaction and involvement of NIST trainer candidates. The OWM is considering how to ensure timely mentoring and continuity for individual instructors who will provide training on behalf of NIST. A number of candidates in the NIST Trainer Program have already served as co-instructors for NIST technical training schools and have done an excellent job. The OWM sincerely appreciates the willingness of those trainers and their directors who have supported their participation to devote time to making these seminars successful.

A list of all people who have attended a "Train the Trainer" class has been posted on the NCWM Web site, whether or not they have worked with NIST as co-trainers or attended NIST technical training schools. OWM has not yet certified anyone (external to NIST) as a "NIST Trainer," but looks forward to doing so once the structure of the Trainer Program is finalized and candidates have satisfied all requirements. At that point, a list of "NIST Trainers" will be posted along with the courses they are authorized to teach on behalf of OWM, and this list will be periodically updated as new trainers and technical areas are authorized. NIST does not have the resources to develop and sustain the development of all of the trainers it invites to participate in NIST trainer program activities and events; however, even if a candidate is not designated to present on behalf of NIST, they and their jurisdictions can benefit from the experience and the candidate can still provide valuable training in their jurisdiction and region.

OWM is also looking at ways to enhance and streamline its training and help prepare students prior to a training class. Students are currently required to complete a self-study course on NIST Handbook 44 prior to attending NIST device-related training seminars. NCWM has graciously agreed to offer an exam for this self-study course through the NCWM Certification Program system and is awaiting feedback from NIST on a beta version of the online exam. As an additional measure, NIST contracted with Mr. Henry Oppermann (W&M Consulting) who developed a Basic

Measuring Course. NIST plans to offer this course as a self-study course and may require it as a prerequisite to participating in NIST seminars on measuring devices. OWM plans to develop a similar course for weighing devices.

OWM appreciates the strong support of the NCWM, the PDC, the volunteer trainers, and their administrators in continuing to develop the NIST Trainer Program. OWM will continue to provide the Committee with updates on its progress as well as continue to collaborate with and support the Committee in its work.

The Committee continues to hear comments from states expressing appreciation for the NCWM Professional Certification Program and the NIST Training Program. The Committee also heard favorable comments about the training materials and tools provided by NIST, including a video on testing retail motor-fuel dispensers (RMFDs). As noted in Item 410-2, the NIST video is divided into segments focusing on specific parts of the RMFD test procedure that can be used to supplement and enhance instructor-led training. The video can be accessed through OWM's home page or by going directly to the following link: **http://www.nist.gov/pml/wmd/lmdg/training-materials.cfm**.

The Committee wants to reiterate that the responsibility for training employees rests with individual organizations (weights and measures jurisdictions and industry alike). While NIST and other training providers offer excellent sources of training and training materials, organizations must develop and manage their own training programs, including developing trainers; establishing individual development plans for employees; and identifying strategies for continually assessing and responding to training needs.

The Committee recognizes that NIST, OWM cannot possibly train all of the weights and measures inspectors in the country. The state and municipal jurisdictions have ultimate responsibility for training and qualifying their personnel. To fulfill this responsibility, jurisdictions should be making individual plans to maintain or bolster their training efforts. NIST, OWM should be viewed as one vital resource to support that effort. The PDC is another resource. The Committee is creating, and posting on its Web site, the "Body of Knowledge" to establish uniform learning objectives for weights and measures professionals. In addition, the Committee has posted a Model Field Training Program document on its Web site (See Item 410-2). This program outlines methods to evaluate and document training and offers guidance on training new inspectors and taking steps to ensure their ongoing development.

All of these initiatives require competent and qualified trainers and a centralized management plan within the jurisdiction. The Committee is beginning work, in partnership with NIST, OWM, to identify the basic competencies of those trainers and training managers so that jurisdictions can find the right people to manage and deliver training internally. It's not enough just to be technically competent in a subject area to be a good trainer or to effectively manage a training program. It takes other tools, such as:

- ability to assess employee competence and training needs;
- ability to create learning materials from technical material;
- ability to use adult learning techniques adapted to individual and group needs;
- ability to plan training activities and find appropriate training venues;
- ability to find creative ways to deliver training with tight budgets; and
- ability to adapt the overall training program to best serve jurisdiction goals.

At their fall 2015 meetings, all four regional weights and measures associations supported maintaining this item as an "Information" item on the Committee's agenda. WWMA continues to support the NIST instructor improvement program, and encourages jurisdictions to use this resource as training needs are identified within their organizations. NEWMA thanks NIST for the quality training provided to the states through the Train the Trainer Program. NEWMA members agreed that having NIST-trained individuals is valuable and several provided examples of how NIST-trained individuals have themselves been able to provide training at regional and state association meetings as a result of participating in the NIST training.

During open hearings at the 2016 Interim Meeting, Ms. Kristin Macey (California Division of Measurement Standards) commented that it would be helpful to have the "trainer" list on the NCWM Web site expanded to include more specific disciplines such as CNG. Ms. Butcher (NIST, OWM) provided an update on activities related to NIST Trainer Program. In spring 2015, NIST held two Instructor Training events (one for laboratory metrology trainers and one for field inspection trainers) in which a number of participants in the NIST Trainer Program participated. OWM hopes to hold another Instructor Training event in 2016, but a date has not yet been set.

In September 2015, The OWM finalized development of a NIST Instructor Training Program Instructor Competency Assessment and Feedback Instrument that can be used as a self-assessment tool by instructors and assist them in identifying and setting goals to strengthen and develop their personal skills as trainers. NIST plans to use this assessment tool to assess its trainers and assist them in their continued development. Included in this assessment tool is a broad list of competencies for trainers based on a model developed by the U.S. Department of Education (see **http://www.pro-net2000.org/CM/content_files/70.pdf for details**). OWM recognizes many trainers who are participating in the NIST Trainer Program have broader training responsibilities within their own agencies and may need to master all of the competencies in this broad list; however, for the purposes of serving as a NIST OWM trainer, only a subset of those competencies may be necessary. For example, a trainer may have responsibilities within his or her own jurisdiction related to the ongoing monitoring and development of individual students; however, this is not a responsibility required of a trainer when conducting a seminar on behalf of NIST. Thus, the OWM assessment tool includes the entire list of competencies found in the DOE model (for the convenience of those trainers with broader responsibilities), but designates those competencies with which OWM expects its external trainers to be proficient.

As previously reported, NIST, OWM is authorized by IACET to issue "Continuing Education Units" for certain training seminars and, as part of this authorization, there are certain provisions that an instructor must follow in order to meet these requirements. NIST Certificates and the accompanying CEUs can only be issued if these criteria are met; this includes ensuring that the material is presented consistent with the learning objectives and interpretations specified by NIST OWM and in the same time frame. OWM staff trainers have completed IACET training courses and are familiar with the procedures that OWM has implemented to ensure compliance with IACET-related requirements for NIST training courses. To ensure that external trainers in the NIST Trainer Program understand these provisions, OWM is continuing work on a series of short webinars that can be used to provide training to its external trainers. OWM will reach out to its trainers to participate in these webinars once they are ready.

Ms. Butcher also commented that OWM's Laboratory Metrology Program has a well-developed mentoring program and has been using external trainers for some time. Over the past two years, OWM has also involved a number of trainers in NIST field training seminars and has received positive feedback from students and hosts on these seminars. She expressed appreciation to those trainers for their work as well as other trainers who have participated in the NIST Trainer Program events. She also thanked Mr. Onwiler and the other NCWM staff for their continued assistance in coordinating travel arrangements for these trainers under the NIST grant to NCWM to support such training activities.

At its 2016 Annual Meeting, NEWMA heard an update fromMr. Ken Butcher (NIST, OWM) who reported that NIST is providing two webinars for trainers: one on the ADDIE model and one on Blooms Taxonomy. NEWMA members in attendance were positive about the use of webinars to provide training. In 2017 NIST would like to provide a three-day train the trainer course. It is not certain if the seminar would be held in a single location such as Gaithersburg, Maryland, or if it would be held regionally. Ms. Lisa Warfield (NIST, OWM) also reported that OWM is looking for trainers who are interested in providing training on NIST Handbook 133.

At the CWMA Annual Meeting, many jurisdictions expressed thankfulness for the NIST Train-the-Trainer program and encourage its continuation. It was noted that the individuals trained in this program are able to return to their respective jurisdictions and tailor the training to meet the needs of the jurisdiction. This enhances training for new regulatory officials. It is also a benefit for trainers participating in this program to be able to meet their peers from across the country.

At the NCWM 2016 Annual Meeting, Ms. Butcher provided an update on activities in the NIST Trainer Program. She began by expressing sincere thanks to the states of Arizona, California, Colorado, Connecticut, Michigan, New York, Ohio, Oregon, and Pennsylvania. These states allowed their trainers to work with NIST staff in presenting a number of the seminars on device and package inspection. These trainers brought considerable expertise to these training events and were instrumental to the success of the events.

Mrs. Butcher also reported that NIST is making an additional $100,000 grant to NCWM to support travel and training events for the NIST Trainer program. OWM continues to work on formalizing the NIST Trainer Program. In the next few months, OWM plans to update records on trainer's preferences and experience, identify needed training and development opportunities, and document requirements and guidelines for the NIST Trainer Program.

Ms. Butcher noted the following development opportunities for NIST Trainers scheduled in the coming months.

- NIST Handbook 133 class for 10 current NIST trainers
  - Testing Packages Labeled by Count and Dimension (August 2016)
- Introductory Webinars
  - Adult Learning Principles (e.g., Bloom's Taxonomy and Introduction to ADDIE Model) (fall 2016)
  - Overview of Instructor Competencies (Spring 2017)
- Introductory three-day training session for new trainers in 2017
- Current trainers in LPG and RMFD will be invited to participate in review and revision of course materials (spring 2017)

410-4 I Recommended Topics for Conference Training

The Board of Directors has charged the Committee with recommending appropriate topics for the technical sessions at future annual meetings. The Board of Directors asks the PDC to review and prioritize possible presentation topics and to submit those to the NCWM Chairman. The Chairman will coordinate with NCWM staff to secure presenters.

The following is a list of technical presentations made at the NCWM since 2009. Presentations given since 2010 are available at www.ncwm.net/meetings/annual/archive.

- Motor Oil Quality Violations (Mr. Tom Glenn, Petroleum Quality Institute of America, 2014);
- Making Sense of Electronic Receipts (Mr. Justin Hotard, Vice President and General Manager, NCR Corporation, 2014);
- LNG & CNG Motor Fuel – A Technical Briefing from Industry (Mr. Doug Horne, President CVEF, Mr. Zack Wester, Blu, Mr. Jeff Clarke, NGVA, 2014);
- Taximeter Technology Advancements (Mr. Matt Daus, International Association of Transportation Regulators, 2013;
- Advanced Vehicles and Fuel Quality (Mr. John M Cabaniss, Jr., Association of Global Automakers, 2013);
- Economic Justification and Demonstrating Value of Weights and Measures (Mr. Tim Chesser, Arkansas Bureau of Standards, 2012);
- Conducting Effective Marketplace Surveys and Investigations (Ms. Judy Cardin, Wisconsin Weights and Measures, 2012);
- Public Relations and Customer Service as Regulators (Mr. Doug Deiman, Alaska Division of Measurement Standards/CVE, 2012);
- An Overview of Unit Pricing in the United States (Mr. David Sefcik, NIST, OWM, 2011);
- Grocery Unit Pricing in Australia (Mr. Ian Jarratt, Queensland Consumers Association, 2011);
- Grocery Unit Pricing in Canada (Mr. Ian Jarratt, Queensland Consumers Association, 2011);
- The U.S. Hydrogen Measuring System: The Turning Point? (Ms. Kristin Macey, California Division of Measurement Standards, 2011);
- Corrosion in Ultra Low Sulfur Diesel Underground Storage Systems (Mr. Prentiss Searles and Ms. Lorri Gainawi, American Petroleum Institute, 2010);
- Risk-Based Inspection Schemes (Mr. Henry Oppermann, Weights and Measures Consulting, LLC, 2010);
- Diesel Exhaust Fluid (DEF) (Mr. Gordon Johnson, Gilbarco, Inc., and Mr. Randy Moses, Wayne, 2009);
- Fuel Volatility and Ethanol Blending (Mr. Jim McGetrick, BP Products, 2009);
- Investigative Techniques (Mr. Michael Cleary, Retired, 2009);
- Automatic Temperature Compensation (ATC) Field Test Procedures (Mr. Don Onwiler, Chair ATC Steering Committee, 2008);
- Elements of an Effective Safety and Health Program (Mr. Dan Whipple, OHST Vermont Department of Labor, 2008);
- Analyzing Temperature Compensation Data (Mr. Henry Oppermann, NIST OWM, and Mr. Steven Malone, Nebraska Division of Weights and Measures, 2007);

- The Great Temperature Compensation Debate (Mr. Ross Andersen, New York Bureau of Weights and Measures, 2007);
- NIST Handbook 44, Scale Code Tare Changes (Mr. Steve Cook, NIST, OWM); and
- Transportation Network Systems (Panel discussion, NCWM Interim Meeting 2016).

At their fall 2015 meetings, all four regional weights and measures associations supported maintaining this item as an "Information" item on the Committee's agenda. The regional associations suggested the following topics be considered for technical presentations at the NCWM meetings:

- audit trails; skimmers;
- witness testing of registered service agency tests;
- CNG/LNG testing; and
- master meters

The WWMA also suggested that the Committee clean up the listings of topics to eliminate older suggestions and topics that have already been covered.

During open hearings at the 2016 Interim Meeting, the Committee heard a suggestion from Ms. Kristin Macey (California Department of Measurment Standards) for a training session on transportation network systems. Mr. Doug Musick (Kansas) commented that this type of technology is showing up in applications other than just passenger transportation and suggested that training in GPS-based measuring systems in general would be beneficial. He noted that his jurisdiction is encountering a large number GPS-based measuring systems being used in assessing charges for the sale and application of crop fertilizers and other treatments and he noted that the monetary impact is significant.

The Committee also heard comments from Mr. Jim Pettinato (FMC), Chairman of the NTEP Software Sector, who noted that training on issues related to inspection of software-based systems may be beneficial to weights and measures jurisdictions. He noted that with the current progress of proposals through the NCWM process, the Sector is wrapping up its initial work and suggested that the Sector and its members might be able to provide assistance in training on legal metrology issues relative to software-based weighing and measuring systems. Ms. Julie Quinn (Minnesota) commented that this assistance might be particularly helpful in assisting weights and measures jurisdictions in understanding and educating inspectors and service personnel on audit trails used in these devices, and she noted that audit trail training is the most frequently requested training topic in her jurisdiction.

The Committee appreciates the input and ideas that it has received regarding suggested training topics. Based on the comments received during its open hearings, comments from the fall 2015 regional association meetings, past suggestions, and discussions during its Interim Meeting work sessions, the Committee proposes that the BOD consider offering technical presentations on the following topics:

- Verifying Compliance of Software-Controlled Weighing and Measuring Systems;
  - This might include the verification of software versions, security, and other metrologically significant issues.
- Understanding Transportation Network Systems;
- GPS-Based Measuring Systems Used in Applications Other Than Passenger Transport;
- Vehicle-Tank Metering Systems "Flush Systems";
- Credit/Debit Card Skimmers.

The Committee also discussed the audience that is typically present at NCWM Annual and Interim Meetings, noting that inspectors and service personnel are not always able to participate in these meetings. The Committee believes it would be beneficial not only to offer training on key issues such as those listed above at the NCWM meetings, but to have the training made available at regional and state weights and measures association meetings where more inspectors and service personnel would be likely to attend. Some aspects of the training might need to be tailored more toward field inspection than weights and measures administration, but much of the content should be the same. The Committee would like to collaborate with regional weights and measures associations to suggest that similar training be provided at the regional level.

At the 2016 NCWM Annual Meeting, the Committee suggested that technical training on safety programs be included at Regional and National Meetings, including an update provided by Ms. Quinn at the 2016 Annual Meeting. The Committee received no additional suggestions or comments regarding proposed training topics.

420 PROGRAM MANAGEMENT

420-1 I Safety Awareness

One of the goals of the PDC is to educate jurisdictions on safety issues and to provide resources to help them implement effective safety and health management programs. The Committee intends to use the safety page on the NCWM Web site (**https://www.ncwm.net/resource/safety**) as a place for states to share information and resources to help them address each of the major steps in creating and maintaining an effective safety program.

One such resource is the recently published draft of OSHA's Safety and Health Management Program Guidelines (**https://www.osha.gov/shpmguidelines/SHPM_guidelines.pdf**). This 44 page document is written in plain language and is aimed at helping small organizations establish, maintain, and improve safety and health management programs. It provides guidance on the seven core elements of safety and health program management:

- Management Leadership;
- Worker Participation;
- Hazard Identification and Assessment;
- Hazard Prevention and Control;
- Education and Training;
- Program Evaluation and Improvement; and
- Coordination and Communication on Multiemployer Worksites.

A link to these guidelines is available on the safety page of the NCWM Web site.

At their Fall 2015 meetings, the regional weights and measures associations expressed continued support for including this item as an Informational item on the Committee's agenda. PDC members participating in the regional meetings highlighted the PDC's work in this area and encouraged states to submit comments and concerns that would assist other jurisdictions in increasing awareness of safety related issues in various areas of weights and measures inspections. The WWMA heard comments regarding a particular need for safety-related information and training for new and emerging fuels and encouraged jurisdictions to pursue safety training in these inspection areas. NEWMA expressed support for the NCWM PDC's efforts to gather and create a repository for safety-related incidents.

At the 2016 Interim Meeting, the Committee agreed that it is important for the Committee to open up dialog with the regions on safety awareness and on knowing how to mitigate or eliminate safety issues. Sharing reports of lost time and restricted work injuries can be one way for agencies to identify hazards which they might otherwise overlook. Following the 2016 Interim Meeting, the Committee designed an online survey covering incidents which resulted in lost or restricted time in 2015. NCWM invited jurisdictions to participate in that survey from February 1 - April 30. The results will be reported at the 2016 Annual Meeting. All responses will be confidential. Data will be grouped by region and also reported for the Nation as a whole. The Committee expects to repeat the survey annually. The intent is to use survey results to identify new hazards and training needs, and to establish a bench mark to measure whether safety is improving over time in the weights and measures field.

Other potential items for future inclusion on the safety page include links to resources on:

- OSHA consultation services;
- Job hazard analysis;
- Field level hazard analysis;
- Hierarchies of hazard control; and
- Safety training resources.

Each safety program is unique to its organization. Each agency is responsible for designing, implementing, and maintaining its own safety program. Resources provided on the web page are intended only to assist agencies as they develop and improve their own safety programs. Safety is not only first; it is first, last, and always. The work of maintaining and improving a safety program never ends.

Currently, the safety page houses the list of regional safety liaisons and an archive of past safety articles. The Committee wishes to thank the people listed below for their contributions.

Regional Safety Liaisons:

- **Central Weights and Measures Association (CWMA):** Ms. Julie Quinn, Minnesota Weights and Measures Division;
- **Northeastern Weights and Measures Association (NEWMA):** Mr. Michael Sikula, New York Bureau of Weights and Measures;
- **Southern Weights and Measures Association (SWMA):** Ms. Elizabeth Koncki, Maryland Department of Agriculture; and
- **Western Weights and Measures Association (WWMA):** Mr. Brett Gurney, Utah Department of Agriculture and Food.

NCWM Newsletter Safety Article Contributors:

- **Elizabeth Koncki (MD)**: *Driving While Towing a Trailer*, 2015 Issue ;1
- **Brett Gurney (UT)**: *Don't Be a Statistic: Watch for Workplace Hazards*, 2015 Issue 2;
- **Doug Rathbun (IL)**: *Defensive Driving,* 2015 Issue 3; and
- **Mike Sikula (NY):** *Safety Recommendations: Climbing Tanker Trucks for Sampling or Inspection,* 2016 Issue 1.

The Committee asks for suggestions for safety articles that people would like to see in future newsletters and/or safety issues that need to be addressed immediately. The Committee reminds regional associations to check the submission deadlines for their upcoming article assignments. E-mail all articles to NCWM headquarters at **info@ncwm.net**.

Issue	Article Source	Article Deadline
Issue 2: May 2016	SWMA	April 15, 2016
Issue 3: September 2016	SWMA	August 15, 2016
Issue 1: February 2017	CWM	January 15, 2017
Issue 2: May 2017	NEWMA	April 15, 2017
Issue 3: September 2017	SWMA	August 15, 2017
Issue 1: February 2018	WWMA	January 15, 2018

At its 2016 Annual Meeting, NEWMA expressed interest in reviewing the statistics from a safety survey sent out by the NCWM to State Directors. At the CWMA 2016 Annual Meeting, Ms. Quinn, Central NCWM Representative to the PDC, gave a presentationon on the results of that survey. The presentation included statistics for the Central region and spoke to the need to identify and develop safety programs to eliminate employee injuries and loss. Jurisdictions are encouraged to continue participation in the annual survey. NIST, OWM representatives at the meeting stated that this is a great start to improve safety awareness. The presentation will be posted to the CWMA web site for review by interested parties.

At the 2016 NCWM Annual Meeting, the Committee presented a slide show covering the following points. This presentation will also be available on the NCWM Web site.

- What the NCWM Safety Survey is and how your organization can participate in it;
- How to calculate different types of incident rates for your organization and why these numbers are important;
- What the results of the NCWM Safety Survey were so that you can compare your program to regional and national results;and
- How to assess, prioritize, and mitigate safety hazards using this information.

The results of the National Safety Survey are shown below. If you did not participate, but would still like to contribute 2015 safety data to this survey, please contact NCWM Executive Director, Mr. Don Onwiler. Industry is also invited to participate and provide data. Updated survey results will be presented at the 2017 NCWM Interim Meeting. A survey requesting 2016 data will be opened for submissions in March 2017.

The following summarizes the:

Data Provided by States and Organized by Region:

Number of States	Region	Employees	Hours	Lost	Restricted	LRT	Total	DART[1]
2	North East	222	155000.0	0	0	0	0	0.0
2	Southern	140	281020.0	5	0	1	6	4.3
8	Central	185	341089.1	7	1	5	13	7.6
5	Western	114	193822.5	3	2	3	8	8.3
17	Total	661	970931.6	15	3	9	27	5.6

The following summarizes the:

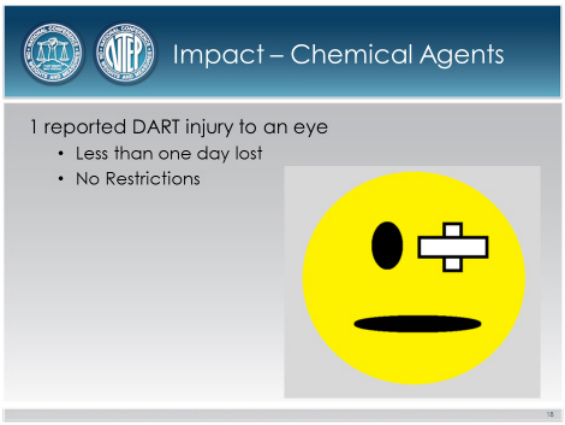
Causes of Incidents that Led to Days Away/Restricted Time (DART):

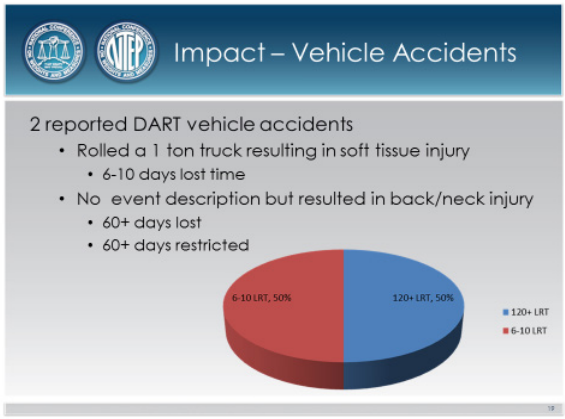
National Safety Survey Data Summary

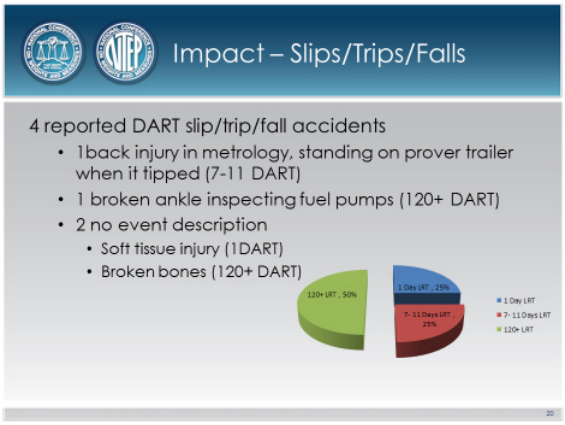
Cause	Central	Southern	Western	Totals
Chemical agent	0	1	0	1
Vechicle accident	2	0	0	2
Slips, trips, falls	1	1	2	4
Lifting, bending, twisting	5	3	3	11
Totals	8	5	5	18

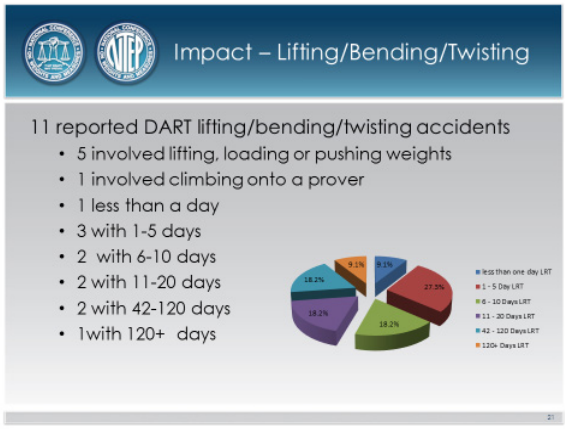
The reported impact of each cause is summarized in the following slides excerpted from Ms. Quinn's presentation.

[1] DART Days Away/Restricted Time.









Ms. Angela Godwin, Ventura County, California | Committee Chair
Mr. Stacy Carlsen, Marin County, California | Member
Ms. Julie Quinn, Minnesota | Member
Mr. Doug Killingsworth, Georgia | Member
Ms. Cheryl Ayer, New Hampshire Member
Mr. Richard Shipman, Rice Lake Weighing Systems | Associate Membership Representative
Ms. Tina Butcher | NIST Liaison
Mr. Ross Andersen | Certification Coordinator

Professional Development Committe

Report of the
National Type Evaluation Program (NTEP) Committee

Mr. Ronald Hayes, Chairman
Missouri

500 INTRODUCTION

This is the report of the NTEP Committee (hereinafter referred to as the "Committee") for the 101st Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, testimony heard at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The informational items presented below were adopted as presented when the Committee's report was approved.

Table A identifies the agenda items and appendix items. The agenda items in the Report are identified by Reference Key Number, title, page number and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. The first three digits of the Reference Key Numbers of the items are assigned from The Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **Informational (I) Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table C provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered individually; others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. When used in this report, the term "weight" means "mass."

Note: The policy of NIST is to use metric units of measurement in all publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to U.S. customary units.

Table A
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Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
CC	Certificate of Conformance	NCWM	National Conference on Weights and Measures
CIML	International Committee of Legal Metrology	NIST	National Institute of Standards and Technology
DoMC	Declaration of Mutual Confidence	NTEP	National Type Evaluation Program
IV	Initial Verification	OIML	International Organization of Legal Metrology
MAA	Mutual Acceptance Arrangement	OWM	Office of Weights and Measures
MC	Measurement Canada	R	Recommendation
MDMD	Multiple Dimension Measuring Devices	VCAP	Verification Conformity Assessment Program
MRA	Mutual Recognition Arrangement		

Table C
Summary of Voting Results

Reference Key Number	*House of Senate Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
To Accept the Report	Voice Vote				Adopted

Details of All Items
(In order by Reference Key)

510 INTERNATIONAL

510-1 Mutual Recognition Arrangement (MRA)

Background/Discussion:
The MRA between Measurement Canada (MC) and NTEP labs originated April 1, 1994. Since that time, the original MRA has expanded, and a second MRA covering measuring devices was developed. On Tuesday, July 19, 2011, NCWM Chair, Mr. Tyson, and MC President, Mr. Johnston, signed a five-year renewal MRA that combined the weighing and measuring devices into one document and provides for continued cooperation between the two organizations and continuation of the beneficial partnership. The MRA is scheduled to be renewed in 2016.

The scope of the current MRA includes:

- gasoline and diesel dispensers;
- high-speed dispensers;
- gasoline and diesel meters intended to be used in fuel dispensers and truck refuelers;
- electronic computing and non-computing bench, counter, floor, and platform scales with a capacity up to 1000 kg (2000 lb);
- weighing/load receiving elements with a capacity of up to 1000 kg (2000 lb);
- electronic weight indicating elements (except those that are software based, i.e., programmed by downloading parameters); and
- mechanical scales up to 10 000 kg (20 000 lb).

MC, NTEP, and all our mutual stakeholders agree the MRA is a benefit for the North American weights and measures industry. The NTEP Committee appreciates the efforts and cooperation of MC and is working with MC to continue and expand the arrangement.

During the 2014 Annual Meeting, MC announced their agreement to accept test data recorded by an NTEP evaluator at a manufacturer's facility, as per the NTEP contingency plan, if the test site and test plan were agreed upon prior to testing. The NTEP Committee continued discussion with MC to include Multiple Dimension Measuring Devices (MDMD) in the MRA. Concerns have been documented by the NTEP MDMD Work Group, Measurement Canada,

and NTEP laboratories pertaining to the inclusion of MDMD devices in Annex B of the MRA. After further consideration, the NTEP Committee has decided not to move forward with the proposal to include MDMD in the MRA. The NTEP Committee plans to move forward with renewal of the MRA as it is currently structured.

For informational purposes, the following is the current MRA as published in NCWM Publication 14 (2015), Administrative Policy.

7.1 US/Canada Mutual Recognition Arrangement on Type Evaluation

7.1.1 Purpose

The Purpose of this Mutual Recognition Arrangement (MRA) is to establish a working relationship to implement a voluntary program for the mutual recognition of the device evaluations administered and performed by Measurement Canada (MC), a special operating agency of Industry Canada, and the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures, Inc. (NCWM) of the United States.

7.1.2 Background

MC and NCWM operate ongoing type evaluation systems for commercial weighing and measuring devices. Canada, many states and several U.S. Federal agencies require the evaluation and approval of the design and performance of device prototypes prior to their sale for commercial use.

Rather than submitting commercial devices for the United States market to NTEP laboratories and essentially the same devices for the Canadian market to the MC's Approval Services Laboratories, manufacturers requested that United States and Canada (1) combine their evaluation tests and (2) recognize either NTEP laboratory or MC laboratory results of the combined evaluation as the basis upon which NTEP and MC would each issue their evaluation documents (either the NTEP Certificate of Conformance or the Canadian Notice of Approval). Expected benefits include: increase uniformity of test methods reducing unnecessary differences, misunderstandings, and unnecessary duplications; reduced cost and improved turn-around time by accessing a single source for type evaluation for both countries; increased competitiveness for both U.S. and Canadian manufacturers by accelerating the time from design to the end markets.

The following policy was adopted in January 1993 by the National Conference on Weights and Measures (predecessor to the National Conference on Weights and Measures Inc.) in concert with Measurement Canada (then known as Legal Metrology Branch):

"With respect to weights and measures devices, the parties agree that the most effective means to remove barriers to free trade is to achieve mutual recognition of device type evaluation testing. This necessarily involves the comparative analysis of type evaluation codes and test procedures together with the intent of streamlining and minimizing differences in so far as possible so as to enable efficient device evaluation while preserving the technical capability and competence of their mutual laboratories."

7.1.3 Agreement

The United States National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures Inc. (NCWM) and Measurement Canada (MC) agree to recognize each other's type evaluation results:

- NCWM will recognize the results of the tests performed by MC for the purpose of issuing NTEP Certificates of Conformance for device types set out in the annex A and B to this arrangement.
- MC will recognize the results of the tests conducted by NTEP Participating Laboratories for the purpose of issuing a Canadian Notice of Approval for the devices types set out in the annex A to this arrangement.

- Each party will continue to issue its own document (either the NTEP Certificate of Conformance or the Canadian Notice of Approval).

7.1.4 Collaboration

Both parties will collaborate to eliminate or minimize differences in requirements and test methods so as to enable efficient devices evaluation.

Each party will:

Make all information available to the other party, maintaining confidentiality of proprietary information;

- Collaborate in the development of additional areas of mutual recognition;
- Collaborate in the development of requirements and tests methods for commercial devices and systems;
- Collaborate in the development and maintenance of proficiency and uniformity of evaluation; and
- Collaborate to preserve the technical capability and competence of their mutual laboratories.

7.1.5 Resolution of Complaints

This MRA does not create binding obligations under international law. However, each party will investigate complaints that the other party brings forward, and both parties will work together to seek satisfactory resolution of such complaints.

7.1.6 Duration and Termination

This MRA will become effective on July 19, 2011. It will remain in effect for a period of five (5) years and may be extended by mutual consent. This MRA may be terminated at any time by either party upon six (6) months written notice to the other party.

7.1.7 Application for Type Approval

Under this arrangement, any applicant for type approval is free to apply to either country when requesting type approval in both countries.

Annex A

Devices for which NCWM and MC will recognize the results of the tests performed at the NTEP Participating Laboratories or MC Laboratory for the purpose of issuing NTEP Certificates of Conformance (USA) and Canadian Notice of Approval:

- Electronic weight indicating elements (except those that are "software based" i.e. programmed by downloading parameters);
- Electronic computing and non-computing bench, counter, floor and platform scales up to 1000 kg (2000 lb) capacity;
- Weighing/load receiving elements with capacities up to 1000 kg (2000 lb); and
- Mechanical scales with capacities not exceeding 10 000 kg (20 000 lb).

Annex B

Devices for which NCWM will recognize the results of the tests performed by MC for the purpose of issuing NTEP Certificates of Conformance:

- Gasoline Dispensers;
- High-Speed Refuellers; and
- Electronic Registers for Dispensers.

On Tuesday, July 26, 2016, NCWM Chair, Jerry Buendel, and Measurement Canada President, Alan Johnston, signed a renewal MRA that provides for continued cooperation between the two organizations and continuation of the 22 year beneficial partnership. The new MRA will be effective for five years.

510-2 Mutual Acceptance Arrangement (MAA)

Background/Discussion:
Information regarding the International Organization of Legal Metrology (OIML) MAA can be found at **www.oiml.org/maa**. NCWM has signed the OIML MAA Declaration of Mutual Confidence (DoMC) for Recommendation (R) 60 Load Cells as a utilizing participant. A utilizing participant is a participant that does not issue any OIML Certificate of Conformance (CC) nor OIML Test Reports and/or Test Reports under a DoMC but does utilize the reports issued by issuing participants.

The United States (NTEP) supported the OIML B 10 documents for the MAA with the provision that the use of manufacturer test data was clearly identified on the MAA test report because NTEP cannot use manufacturer test data towards issuance of an NTEP certificate. Consequently, the CIML voted and approved the Amendment to B 10 to allow the inclusion of test data from manufacturers, on a strictly voluntary basis, at its October 2012 meeting in Bucharest, Romania. Dr. Chuck Ehrlich gave an update to the Committee reviewing the history of the above discussions, deliberations, and CIML votes confirming that the outcomes aligned with the NTEP Committee's recommendations and the instructions provided by the NCWM Board of Directors.

Dr. Charles Ehrlich requested on multiple occasions that NCWM review its MAA policy regarding participation in R 76. The NCWM Board recapped the decision process to participate as a utilizing participant for R 60. Existing policy from 2006 is not to participate in R 76 until NCWM is able to do so as an Issuing Participant. The Board has revisited the 2006 discussions leading to that decision, including considerations for NTEP labs' workload, potential lost expertise, concerns with quality of evaluations at some foreign labs, etc. Dr. Ehrlich wanted NCWM to reconsider and, if there was no possibility in sight that the NCWM could become an Issuing Participant, then it should consider becoming a utilizing participant for OIML R 76. Some U.S. manufacturers support NCWM policy, but others would like to have one-stop shopping. The MAA also includes R 49 (water meters) and R 117 (RMFD) may be added soon. Since there are no new developments to affect the decision, the NCWM Board of Directors agreed to maintain existing policy at this time.

From January 2011 to June 2016 fifty-one NTEP certificates for load cells were issued under the MAA. he NTEP Administrator reviewed all MAA test data and drafted the NTEP certificates.

Because of the more recent difficulties encountered by the International Bureau of Legal Metrology (BIML) in adequately obtaining and summarizing peer review and/or accreditation data from the MAA test laboratories, it has been proposed that more robust OIML Certification System (OIML-CS) be developed that has a Management Board to develop policy (subject to approval by the International committee on Legal Metrology, or CIML) and oversee operations. A preliminary plan for developing the OIML-CS has been prepared, and will be presented to the CIML for its approval.

The next meeting of the Committee on Participation Review (CPR) for R 60 and R 76 is scheduled for March 22 - 23, 2016, in Denmark. Plans are for Dr. Ehrlich, National Institute of Standards and Technology (NIST), Office of Weights and Measures (OWM); Mr. John Barton, NIST, OWM; and Mr. Darrell Flocken, NCWM to attend the meeting.

520 ACTIVITY REPORTS

520-1 I NTEP Participating Laboratories and Evaluations Reports

Background/Discussion:
The NTEP weighing and measuring laboratories held a joint meeting April 5 - 7, 2016, in Columbus, Ohio. The NTEP laboratories, NTEP Committee, and NCWM Board of Directors expressed appreciation to Mettler-Toledo for allowing

the NTEP weighing laboratories to utilize their facilities and equipment for hands on training. Special thanks are extended to Mr. Russ Vires, Mr. Scott Davidson, and Mettler-Toledo employees in the training activities.

The NTEP weighing laboratories met in August 2016, prior to the NTEP Weighing Sector meeting in Denver, Colorado.

NTEP continues to routinely survey customers pertaining to NTEP administration and laboratories' customer service. The survey is released to active CC holders. The board routinely reviews the results of the survey to form a continuous improvement plan for NTEP. With any survey, the challenge is to develop a document that is concise enough that customers will respond, while also providing a meaningful set of data. To date, the NCWM Board of Directors is finding general approval of NTEP services.

During the 2016 Annual Meeting, the Committee reviewed NTEP statistics through June 2016.

The review of statistics shows that incoming applications are relatively comparable to normal and there exist no significant laboratory backlog issues. See Appendix A.

The State of California announced that they are resuming their activities as an NTEP weighing laboratory. The States of Kansas expressed their interest to pursue authorization as a NTEP Participating Field Laboratory for large capacity weighing devices. NTEP continues working with Kansas toward that goal.

520-2 I NTEP Sector Reports

Background / Discussion:
All NTEP Sector reports were available to members at the time NCWM Publication 15 was published. The NTEP Committee is committed to ensuring that electronic versions of sector reports are available with NCWM Publication 15. Please note that the sector reports will only be available in the electronic version of NCWM Publication 15 at **ncwm.net/meetings/interim/archive**; they will not be available in the printed versions of NCWM Publication 15.

NTEP Belt-Conveyor Scale Sector:
The NTEP Belt-Conveyor Scale Sector met February 26, 2015, in St. Louis, Missouri. A final draft of the meeting summary was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval (See Appendix B).

A meeting of the NTEP Belt-Conveyor Scale Sector was held February 23, 2016, in Pittsburgh, Pennsylvania. For questions on the status of Sector work or to propose items for a future meeting, please contact the Technical Advisor:

Technical Advisor
Mr. John Barton
NIST, OWM
100 Bureau Drive, MS 2600
Gaithersburg, MD 20899

Phone: (301) 975-4002
Fax: (301) 975-8091
E-mail: **john.barton@nist.gov**

NTEP Grain Moisture Meter and NIR Protein Analyzer Sectors:
It was decided the NTEP Grain Analyzer (GA) Sector would not conduct a meeting in 2015. Neither a face-to-face or web meeting was announced. The decision was made primarily due to a lack of agenda items. Most of the tentative agenda items were updates and reports and the two S&T items (Item 310-1, G-S.1. Identification from the Software Sector and Item 360-4, Appendix D - Definitions: Remote Configuration Capability) are still developing items. Therefore, Sector Chair Karl Cunningham decided to provide a GA Sector Report of Updates instead of holding a web meeting. A report of updates was compiled and circulated to all sector members. A comment sheet for feedback was circulated and summary of comments reported back to the members. A draft of the final summary was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval (See Appendix C).

The next meeting of the NTEP Grain Moisture Meter and NIR Protein Analyzer Sectors is scheduled for September 13 -14, 2016, in Kansas City, Missouri. The second day will be a joint meeting with the NTEP Software Sector. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Technical Advisor:

Technical Advisor
Ms. G. Diane Lee
NIST, OWM
100 Bureau Drive, MS 2600
Gaithersburg, MD 20707
Phone: (301) 975-4005
Fax: (301) 975-8091
E-mail: **diane.lee@nist.gov**

NTEP Measuring Sector:
The NTEP Measuring Sector met September 15 - 16, 2015, in Denver, Colorado. A draft of the final summary was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval. (See Appendix D)

The next meeting of the NTEP Measuring Sector Meeting is scheduled for September 20 - 21, 2016, in Denver, Colorado. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Technical Advisor:

Technical Advisor
Ms. Tina Butcher
NIST, OWM
100 Bureau Drive, MS 2600
Gaithersburg, MD 20899
Phone: (301) 975-2196
Fax: (301) 975-8091
E-mail: **tina.butcher@nist.gov**

NTEP Software Sector:
The NTEP Software Sector met September 16 - 17, 2015, in Denver, Colorado. A final draft of the meeting summary was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval. (See Appendix E)

The next meeting of the NTEP Software Sector is scheduled for September 14, 2016, in Kansas City, Missouri. The meeting will be a joint meeting of the NTEP Grain Analyzer and Software Sectors. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Sector Chair and/or the NTEP Administrator:

Chair
Mr. James Pettinato
FMC Technologies Measurement Solutions, Inc.
1602 Wagner Avenue
Erie, PA 16510
Phone: (814) 898-5250
Fax: (814) 899-3414
E-mail: **jim.pettinato@fmcti.com**

NTEP Administrator
Mr. Jim Truex
NCWM
1135 M Street, Suite 110
Lincoln, NE 68508
Phone: (740) 919-4350
Fax: (740) 919-4348
E-mail: **jim.truex@ncwm.net**

NTEP Weighing Sector:
The NTEP Weighing Sector met August 25 - 26, 2015, in Denver, Colorado. A final draft of the meeting summary was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval. (See Appendix F)

The next NTEP Weighing Sector meeting is scheduled for August 23 - 24, 2016, in Denver, Colorado. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Technical Advisor:

Technical Advisor
Mr. Rick Harshman
NIST, OWM
100 Bureau Drive, MS 2600
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Phone: (301) 975-8107
Fax: (301) 975-8091
E-mail: **richard.harshman@nist.gov**

NTEP Multiple Dimension Measuring Devices (MDMD) Work Group:
The NTEP MDMD Work Group met May 12 - 13, 2015, and September 22 - 23, 2015, in Reynoldsburg, Ohio. A final draft of the meeting summaries was provided to the Committee prior to the 2016 NCWM Interim Meeting for review and approval. (See Appendix G)

A meeting of the NTEP MDMD Work Group was held April 26 - 27, 2016, in Reynoldsburg, Ohio. The next meeting of the Work Group is tentatively scheduled for April 2017 in Columbus, Ohio. For questions on the current status of the work group or to propose items for a future meeting, please contact the Work Group Chair, Mr. Robert Kennington, or NTEP Specialist, Mr. Darrell Flocken.

Chair
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The NTEP Committee reviewed and approved all 2015 NTEP Sector and Work Group reports during the 2016 Interim Meeting.

530 CONFORMITY ASSESSMENT PROGRAM

530-1 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:
Certificates are constantly under review by NTEP staff and laboratories. Many active certificates are amended annually because of manufacturer submission for evaluation or issues reported by the states pertaining to information on the certificate. When the devices are re-evaluated and certificates are amended, all information is reviewed and necessary steps are taken to assure compliance and that accurate, thorough information is reported on the certificate.

In an effort to keep certificate information up to date, the Committee continues to offer an opportunity for active certificate holders to update contact information contained in the "Submitted By" box on certificates. This is offered during the payment period of their annual maintenance fee. Many certificate holders have taken advantage of the opportunity for hundreds of NTEP certificates.

Initial Verification (IV):
The IV initiative is ongoing. Field enforcement officials perform an initial inspection and test on new installations on a routine basis. The Committee recognized that the states do not want IV reporting to be cumbersome.

An IV report form was developed several years ago. The Committee desired a simple form, perhaps web-based for use by state and local regulators. The form was approved by the Committee and distributed to the states. A completed form can be submitted via mail, e-mail, fax, or online. The form is available to regulatory officials who are members of NCWM at **www.ncwm.net/ntep/conformity/verification**.

During the 2014 Annual Meeting, NTEP acknowledged that the regulators have not bought into the IV report form. Industry representatives stated the IV is very important to ensure conformity assessment, and the NCWM should push harder for reporting of non-compliance issues found during IV.

VCAP:
NCWM has been concerned about production meeting type and protecting the integrity of the NTEP Certificates of Conformance (CC) since the inception of NTEP. The board has consistently reconfirmed its belief that conformity assessment is vital to NTEP's continued success.

Load cells traceable to NTEP certificates were selected for the initial assessment effort. NCWM elected to require a systems audit checklist that is to be completed by an outside auditor and submitted to NCWM per Section 221.3.3.3.5 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 website at **www.ncwm.net/ntep/conformity/vcap/checklists-faqs**. Additionally, the Committee developed a new NCWM Publication 14, administrative policy to distinguish between the requirements for parent NTEP certificate holders (21.3.3.2) and private label certificate holders. The requirements in 21.3.3.7 track the private label checklist requirements: traceability to parent NTEP CC, traceability of the private label cell to a VCAP audit, purchase and sales records, plan to report non-conforming product and non-conforming product in stock, plan to conduct internal audits to verify non-compliance action, and internal audit records.

The Committee was given updated VCAP statistics during the 2016 Annual Meeting. Because of VCAP activities, 27 load cell certificates, involving 15 different certificate holders, were changed to "inactive" status. As a result of VCAP activities, for weighing/load receiving elements, 2000 lb capacity and less, using load cells that are not traceable to their own NTEP certificate, 15 certificates, involving 11 different certificate holders, were changed to "inactive" status.

The Committee had discussions about the required number of audits for facilities that manufacture multiple device types. For example, if a company had successful audits for two device types, they might submit a request for a delay from audit requirements for remaining device types, stating they are all subjected to the same processes and will be audited in the next cycle. The Committee agreed to the request in principle and directed the NTEP Administrator to develop NCWM policy language for consideration during the next Board meeting. As a result, the following policy was adopted by the NCWM Board in October 2013.

Adding Device Categories to VCAP:

Policy:

1. When a new device category is added to the VCAP requirement, NTEP will recognize the current VCAP audit certification in effect, submitted by a certificate holder, for the same certificate holder and same production facility(s), to cover the new device category, continue the manufacturing process for devices covered by NTEP certificates in the newly added device category, until the due date of the next VCAP audit.

   Example: If a company had successful audits for two device types, they might submit a request for exemption from audit requirements for remaining device types, stating that they are all subjected to the same quality management system and will be included in the next audit cycle. The next VCAP audit must be done within three years of the last audit and address all applicable device types produced within that facility.

Seven weighing device categories subject to influence factors, as defined in NIST Handbook 44, were identified and are subject to VCAP audits. The VCAP process requirement is ongoing for load cells, weighing elements that use non-NTEP load cells and indicating elements. Certificate holders for these device types are required to have an on-site audit of the manufacturer's quality system and on-site random and/or review of a production device by an outside auditor to verify compliance with VCAP. Certificate holders are encouraged to research the VCAP requirements on the NCWM website under the NTEP, Conformity Assessment section. Certificate holders are encouraged to review the VCAP requirements applicable to their devices and report concerns to the NTEP Committee.

The Committee decided during the 2014 Annual Meeting to include indicating elements and approved the following timeline

<table>
<tr><th colspan="6">NCWM/NTEP VCAP Compliance Timeline
Indicating Elements</th></tr>
<tr><th>Jan. 2015 -
March 2015</th><th>Jan. 2015 -
May 2016</th><th>Jan. 2015 -
Nov. 2016</th><th>Jan. 2015 -
Dec. 2016</th><th>June 2016</th><th>Dec. 2016</th></tr>
<tr><td rowspan="3">NTEP notifies active CC holders of VCAP requirements</td><td>Parent CC holders to put VCAP QM system in place</td><td>Private Label CC holders to put VCAP QM system in place</td><td>NTEP evaluates incoming audit reports</td><td rowspan="3">NCWM declares CCs inactive if Parent CC holder fails to comply with VCAP</td><td rowspan="3">NCWM declares CCs inactive if Private Label CC holder fails to comply with VCAP</td></tr>
<tr><td>CC holder to have audit conducted by Certified Body</td><td>CC holder to have audit conducted by Certified Body</td><td rowspan="2">NTEP contacts CC holders not meeting VCAP requirements to encourage compliance</td></tr>
<tr><td>Submit audit report to NCWM/NTEP</td><td>Submit audit report to NCWM/NTEP</td></tr>
</table>

The following disclaimer has been advertised and communicated by NCWM: NCWM is working to identify all active certificates subject to VCAP compliance. As a courtesy, affected certificate holders are being notified of VCAP requirements and the established time line. Please note that the NCWM Board of Directors does not consider it to be NCWM's responsibility to notify all certificate holders about affected certificates. Certificate holders are responsible for reviewing their active NTEP certificates and compliance with VCAP

The Committee has received letters, questions, and many other inquiries pertaining to VCAP. The Committee has worked diligently to answer the questions submitted in a very timely manner. The Committee knows that additional questions will be posed as VCAP progresses. Certificate holders and other interested parties are encouraged to submit written questions to the NTEP Committee. The Committee is pleased to report that it has been successful in answering all the questions to date. Clerical changes have been made to affected VCAP documents as deemed necessary. Two companies stated during the 2016 Annual Meeting Open Hearings that VCAP was a beneficial program and expressed appreciation for the NCWM effort. The Committee would like to thank them for their complimentary remarks.

530-2 Device Categories Subject to VCAP

Source: NTEP Committee

Item under Consideration:
NCWM must decide when to include the four remaining device categories subject to VCAP. The four remaining categories include: complete scales, automatic weighing systems, belt-conveyor scales and automatic bulk weighing systems. The Committee is working to develop a timeline to include the remaining categories.

Background/Discussion:
During the 2015 Interim and Annual Meetings, the Committee heard no comments about their announced intent to include the remaining categories in the near future. The Committee is strongly considering developing a timeline to include the four remaining device categories. This includes both Manufacturers and Private Label Holders of Certificates of Conformance (CC) for these Device Types.

- Complete Scales,*
- Automatic Weighing Systems,
- Belt-Conveyor Scales, and
- Automatic Bulk Weighing Systems.

During the 2014 Annual Meeting, the Committee heard objections from several companies to expanding VCAP to all device types. The NTEP Committee made the decision to pull back their proposal to include all remaining device categories under VCAP, only adding a timeline for indicating elements. During the 2015 Interim and Annual Meetings, the Committee heard testimony opposing their consideration to include weighing/load-receiving elements using load cells traceable to an NTEP certificate. The Committee received letters from Cardinal Scale, Fairbanks Scales, and Rice Lake Weighing Systems opposing the inclusion of all weighing/load-receiving elements primarily because such inclusion would be redundant, resulting in the unnecessary expense of additional VCAP testing. The SMA is also on record opposing the inclusion.

The NTEP Committee and NCWM Board has agreed not to include weighing/load receiving elements using NTEP load cells in the list of device categories subject to VCAP. However, the Board notified certificate holders that they have no intention of amending the table of devices subject to influence factor testing found in the Weighing Devices Section of NCWM Publication 14.

When VCAP requirements are applied, the certificate holder is required to have an on-site audit of the manufacturer's quality system and on-site random and/or review of a production device by an outside auditor to verify compliance with VCAP. Certificate holders are encouraged to research the VCAP requirements on the NCWM website under the NTEP, Conformity Assessment section, review the VCAP requirements applicable to their devices and report concerns to the NTEP Committee.

During the 2016 Interim Meeting, the Committee heard comments proposing that the remaining device categories be phased in over a period of several years. The Committee appreciates the input from the stakeholders. NTEP has developed the following proposed timelines to phase in the remaining device categories. The timelines identify the inclusion of the remaining device types into the NTEP, Verified Conformity Assessment Program. Each timeline includes both manufacturers and private label holders of Certificates of Conformance for the device type. Comments from affected stakeholders are welcomed and appreciated.

Complete Scales:
This device type includes, but is not limited to, Computing, Non-computing, Point of Sale, Crane, Monorail, and Grain Test Scales with weighing capacities up to and including 2000 lb. It is important to note that the use of an NTEP certified load cell does not qualify the scale for an exemption to the VCAP requirements.

NCWM/NTEP VCAP Compliance Timeline
Complete Scales

Jan. 2017-March 2017	Jan. 2017-May 2018	Jan. 2017-Nov. 2018	Jan. 2017-Dec. 2018	June 2018	Dec. 2018
NTEP notifies active CC holders of VCAP requirements	Parent CC holders to put VCAP QM system in place	Private Label CC holders to put VCAP QM system in place	NTEP evaluates incoming audit reports	NCWM declares CCs inactive if Parent CC holder fails to comply with VCAP	NCWM declares CCs inactive if Private Label CC holder fails to comply with VCAP
	CC holder to have audit completed by authorized auditing company	CC holder to have audit completed by authorized auditing company	NTEP contacts CC holders not meeting VCAP requirements to encourage compliance		
	Submit audit report to NCWM/NTEP	Submit audit report to NCWM/NTEP			

Automatic Weighing Systems:

NCWM/NTEP VCAP Compliance Timeline Automatic Weighing Systems					
July 2017- Sept. 2017	**July 2017- Nov. 2018**	**July 2017- May 2019**	**July 2017- June 2019**	**Dec. 2018**	**June 2019**
NTEP notifies active CC holders of VCAP requirements	Parent CC holders to put VCAP QM system in place	Private Label CC holders to put VCAP QM system in place	NTEP evaluates incoming audit reports	NCWM declares CCs inactive if Parent CC holder fails to comply with VCAP	NCWM declares CCs inactive if Private Label CC holder fails to comply with VCAP
	CC holder to have audit completed by authorized auditing company	CC holder to have audit completed by authorized auditing company	NTEP contacts CC holders not meeting VCAP requirements to encourage compliance		
	Submit audit report to NCWM/NTEP	Submit audit report to NCWM/NTEP			

Automatic Bulk Weighing Systems:

NCWM/NTEP VCAP Compliance Timeline Automatic Bulk Weighing Systems					
Jan. 2018– March 2018	**Jan. 2018- May 2019**	**Jan. 2018- Nov. 2019**	**Jan. 2018- Dec. 2019**	**Jun. 2019**	**Dec. 2019**
NTEP notifies active CC holders of VCAP requirements	Parent CC holders to put VCAP QM system in place	Private Label CC holders to put VCAP QM system in place	NTEP evaluates incoming audit reports	NCWM declares CCs inactive if Parent CC holder fails to comply with VCAP	NCWM declares CCs inactive if Private Label CC holder fails to comply with VCAP
	CC holder to have audit completed by authorized auditing company	CC holder to have audit completed by authorized auditing company	NTEP contacts CC holders not meeting VCAP requirements to encourage compliance		
	Submit audit report to NCWM/NTEP	Submit audit report to NCWM/NTEP			

Belt-Conveyor Scales:

NCWM/NTEP VCAP Compliance Timeline Bulk-Conveyor Scales					
July 2018- Sept. 2018	**July 2018- Nov. 2019**	**July 2018- May 2020**	**July 2018- Jun. 2020**	**Dec. 2019**	**June 2020**
NTEP notifies active CC holders of VCAP requirements	Parent CC holders to put VCAP QM system in place	Private Label CC holders to put VCAP QM system in place	NTEP evaluates incoming audit reports	NCWM declares CCs inactive if Parent CC holder fails to comply with VCAP	NCWM declares CCs inactive if Private Label CC holder fails to comply with VCAP
	CC holder to have audit completed by authorized auditing company	CC holder to have audit completed by authorized auditing company	NTEP contacts CC holders not meeting VCAP requirements to encourage compliance		
	Submit audit report to NCWM/NTEP	Submit audit report to NCWM/NTEP			

During the 2016 Annual Meeting, a scale company asked if the Committee had given any thought to expanding the VCAP audit to a five-year period. NTEP Administrative Policy Section 21.1.3.2.16 allows for a five-year cycle under specific conditions. The NTEP Committee has agreed to explore the issue and develop guidelines and recommendations for the certification bodies.

Another scale company requested that NTEP develop a unified spreadsheet for VCAP. The Committee agrees and has directed NTEP to develop the checklist (spreadsheet) for manufacturers' and VCAP auditors' use.

Two scale companies requested that NTEP consider exempting Automatic Weighing Systems (AWS) and Automatic Bulk Weighing Systems (ABWS) from the VCAP audit requirement if they utilize NTEP certified load cells. The Committee discussed both device categories during their work session. The Committee found that all AWS NTEP certificates were for complete devices per NTEP Technical Policy. Some research also revealed that most ABWS certificate were for the ABWS controller. The hoppers normally used in an ABWS are covered by their own weighing/load-receiving NTEP and are several thousand-pound capacity, hence, already outside the VCAP requirement since they exceed the 2000 lb capacity or less threshold. The Committee was made aware of three NTEP certificates for ABWS which have a capacity of 2000 lb or less, but all three were for complete weighing devices. The Committee concluded the certificates for AWS and ABWS devices are for complete scales or indicating elements/controllers and require a VCAP audit.

The Committee heard no additional objections to the timelines presented and plans to move forward. Comments from affected stakeholders are welcomed and appreciated.

530-3 VCAP Certification Bodies

Source: NTEP Committee

Item under Consideration:
Amend NCWM Publication 14, Administrative Policy as follows:

21.1.3.3.1. The selected Certification Body is to be accredited by ANSI-ASQ National Accreditation Board (ANAB**) or by a Signatory of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition..** The ANSI**, ANAB and ILAC are** ~~**ASQ National Accreditation Board is the U.S.**~~ accreditation ~~**body**~~ **bodies** for management systems. ANAB **and ILAC** accredits certification bodies (CBs) for ISO 9001 quality management systems

(QMS)**, ISO 17025 laboratory testing facilities** and ISO 14001 environmental management systems (EMS), as well as a number of industry-specific requirements~~**, or equivalent**~~.

Background/Discussion:
During the 2015 NCWM Annual Meeting, the Committee informed membership that it plans to consider a recommended amendment to NTEP administrative policy. NTEP has learned that the two organizations (ANAB and ILAC) have a mutual recognition agreement. Researching this fact, NTEP contacted a U.S. Certification Body that is accredited by ANAB and a non-U.S. Certification Body accredited by ILAC and asked them if they would accept an audit report from the other Certification Body. Both responded they would providing that the Certification Body was accredited by a Signatory of the ILAC Mutual Recognition Arrangement, and the ISO/IEC 17025 standard is mentioned in the accreditation bodies recognized scope.

Considering the above information and from what NTEP has read on both the ANAB and ILAC Web sites, there is sufficient justification to accept the work of ILAC accredited auditing firms that are recognized to the ISO/IEC 17025 standard for testing.

As VCAP is expanded to include additional devices and more international manufacturers, it became evident that the limitation of requiring the Certification Body to be accredited by a U.S. based Accreditation Board created a limited pool of Certification Bodies and Auditors to pick from. In addition, NTEP was approached by a few non-U.S. based Certification Bodies requesting that NTEP recognize accreditation organizations such as the International Laboratory Accreditation Cooperation (ILAC).

During the 2016 Interim Meeting, the Committee heard no objections to the proposal. The NTEP Committee consequently authorized the change in the 2016 NCWM Publication 14.

Mr. Ron Hayes, Missouri | Committee Chair
Mr. Jerry Buendel, Washington State NCWM Chairman
Ms. Kristen Macy, California | NCWM Chairman-Elect
Mr. James Cassidy, City of Cambridge, Massachusetts | Member
Mr. Kenneth Ramsburg, Maryland | Member
Mr. Jim Truex, NCWM | NTEP Administrator

National Type Evaluation Program Committee

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Appendix A
NTEP Statistics Report

NTEP Statistics through June 2016

General NTEP Statistics	Last Year	This Year to Date
	10/01/14 – 9/30/15	10/01/15 – 6/30/16
Total Applications Processed	(42) 271	(20) 206
Applications Completed	314	199
New Certificates Issued	281	176
Active NTEP Certificates		1996

( ) = Reactivations

Assignments to Labs per Year	10/1/14 – 9/30/15	10/1/15 – 6/30/16
California	17	22
Canada	1	3
GIPSA-IL	0	1
GIPSA-KC	8	8
Maryland	(12) 54	(4) 34
New York	(6) 11	9
NIST Force Group	3	7
North Carolina	13	8
Ohio	48	(2) 42
Oregon	(1) 1	0
NTEP Field	6	(1) 5
NTEP Administrator	108	67
Applications Not Yet Assigned to a Lab		3

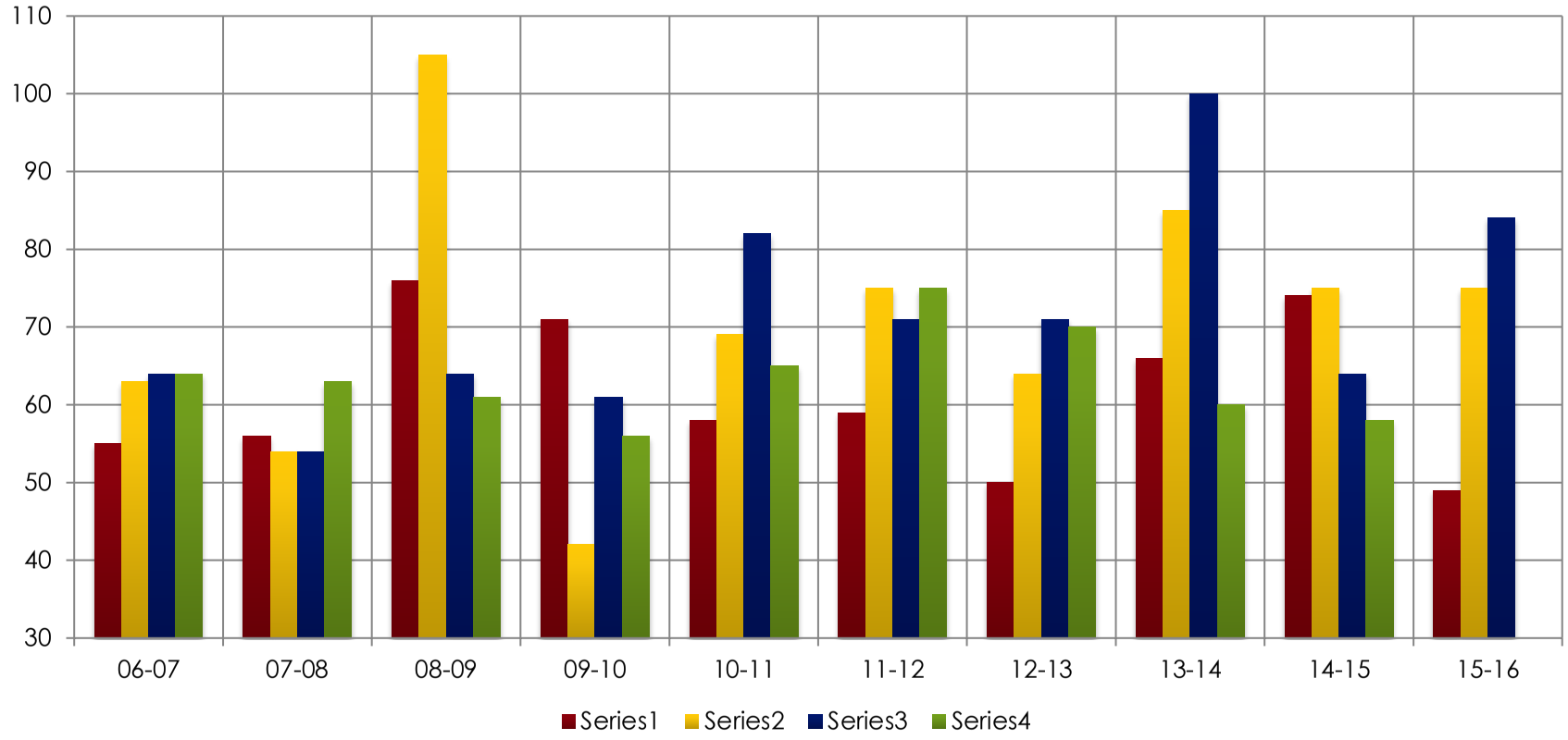
( ) = Reassignments from another lab

Process Statistics	10/2008 - Present
Average Time to Assign an Evaluation	4.9 Days
Average Time to Complete an Evaluation	87.0

Report on Evaluations in Progress

Evaluations in Progress	0-3 Months	3-6 Months	6-9 Months	9-12 Months	Over 1 Year	Total
June 30, 2012	41	21	10	6	20	98
September 30, 2012	50	30	15	7	19	121
December 31, 2012	32	24	17	7	18	98
March 31, 2012	36	12	14	12	18	92
June 30, 2013	53	18	6	6	19	102
September 30. 2013	44	32	5	4	21	106
December 31. 2013	41	25	24	2	24	116
March 31, 2014	53	23	13	17	11	117
June 30, 2014	55	30	14	8	19	126
September 30, 2014	44	38	18	6	19	125
December 31, 2014	44	17	17	12	16	106
March 31, 2015	43	24	10	13	17	107
June 30, 2015	39	21	12	5	15	92
September 18, 2015	28	20	8	5	12	73
December 23, 2015	43	14	5	7	13	82
March 31, 2016	48	15	7	6	8	84
June 30, 2016	57	13	7	3	7	87

In Progress by Lab	0-3 Months	3-6 Months	6-9 Months	9-12 Months	Over 1 Year	Total
California	6	5	1		1	13
Canada	1	1				2
GIPSA-IL		1				1
GIPSA-KC	7			2		9
Maryland	10	2		1	2	15
New York	5	1				6
NIST Force Group	3		3			6
North Carolina	4	2	1		2	9
Ohio	17	1	1		2	21
Oregon						
NTEP Staff	1		1			2
Unassigned	3					3
					Total Pending:	**87**



	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16
Oct – Dec	55	56	76	71	58	59	50	66	74	49
Jan – Mar	63	54	105	42	69	75	64	85	75	75
Apr – Jun	64	54	64	61	82	71	71	100	64	84
Jul - Sep	64	63	61	56	65	75	70	60		
Total	**246**	**227**	**306**	**230**	**274**	**280**	**255**	**271**	**311**	**208**

Average Per Quarter: 10-YR:	**66.9**
Average Per Quarter This FY:	**69.3**

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Appendix B

National Type Evaluation Program (NTEP)
Belt-Conveyor Scale (BCS) Sector Meeting Summary

February 26, 2015
St. Louis, Missouri

INTRODUCTION

The charge of the BCS Sector is important in providing appropriate type evaluation criteria based NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," Sections 1.10. General Code and 2.21. BCS Systems. The Sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14, "Technical Policy, Checklists and Test Procedures" for National Type Evaluation.

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

Proposed revisions to the handbooks/publications are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is the policy of the National Institute of Standards and Technology (NIST) to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references in U.S. customary units.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BCS	Belt-Conveyor Scale	NTEP	National Type Evaluation Program
MTL	Minimum Test Load	NTETC	National Type Evaluation Technical Committee
MWT	Master Weight Totalizer	OWM	Office of Weights and Measures
NCWM	National Conference on Weights and Measures	USNWG	U.S. National Work Group
NIST	National Institute of Standards and Technology		

Details of All Items
(In order by Reference)

I. CARRY-OVER ITEMS

A. Revision of the Belt-Conveyor Scale NTEP Checklist

1. Evaluation Checklist for Retrofit Master Weight Totalizers

Source:
USNWG on Belt-Conveyor Scales

Proposal:
Amend NCWM Publication 14, *Belt-Conveyor Scales* by incorporating recommended changes that primarily were intended to allow for the evaluation of master weight totalizers (MWT) as a component of a belt-conveyor scale system. This was intended to facilitate the certification of MWTs as replacement instruments and would not necessarily require testing on the entire belt-conveyor scale system.

Background:
Prior to the 2009 BCS Sector meeting, Mr. Bill Ripka, (Sector Chair) presented a draft of an amended NCWM Publication 14, Belt-Conveyor Scales Technical Policy, Checklists, and Test Procedures to the sector members for review. The proposed changes in this draft related primarily to MWTs intended to be installed as replacement or retrofitted instruments within an existing BCS system in addition to a number of other minor editorial changes. Among the recommended changes that were included in this draft were changes involving procedures used when evaluating semi-automatic and automatic zero-setting mechanisms.

This proposed draft has been offered to be used on a trial basis by NTEP labs when evaluating manufacturer's replacement instruments (Master Weight Totalizers) that are scheduled to undergo NTEP evaluation.

At the 2014 BCS Sector meeting, it was reported that there has not been any devices submitted for type approval that could appropriately be evaluated using the proposed amended checklist.

Following the February 2014 Sector meeting, the NTEP Belt-Conveyor Scale Sector members were contacted by the Sector Chair, Mr. Bill Ripka, and were asked to participate in a teleconference conducted to ask the Sector to deliberate on possible additional changes to the proposed amendments of NCWM Publication 14, *Belt-Conveyor Scales Technical Policy, Checklists, and Test Procedures.*

The primary focus of the teleconference was for the members to consider a change that would eliminate the requirement for a field permanence test as part of a type evaluation outlined in these proposed changes. Most Sector members agreed that a permanence test is necessary for the proper evaluation of an entire belt-conveyor scale system when installed; however, this recommended further revision of this proposal and is based upon the notion that a permanence test is not warranted for a MWT that is installed as a retrofit or replacement instrument for an existing system. The additional changes would not eliminate any type of testing performed under laboratory conditions.

Following the teleconference and several follow-up e-mail exchanges among the Sector members, the Sector was asked to respond to a ballot indicating whether this revision to the original proposal was supported. The balloting of the Sector members was conducted through e-mail and the results indicated all active members of the Sector supported the elimination of a permanence test for replacement instruments. The Sector agreed that in addition to the removal of a required permanence testing during a type evaluation for a MWT, several minor editorial changes were also approved. The Sector Chair agreed to forward the revised proposal to the NTEP Administrator.

Discussion:
Some participants of the 2015 meeting of the BCS Sector asked for clarification on whether a MWT submitted for NTEP evaluation under the conditions of this proposal would be required to be installed in a conveyor system as needed for the performance of a material test as part of that type evaluation. The members of the Sector present at the meeting agreed the NTEP evaluation procedure for a MWT as a stand-alone instrument would not include any material test performed in the field. It was recognized however that a MWT covered under a Certificate of Conformance issued using the procedure prescribed in this proposal would need to be certified as a commercial device in the field when that particular instrument was installed as part of a BCS system. This field certification by statutory authorities would then include all elements of an examination prescribed for an initial test.

Conclusion:
The participants of the 2015 BCS Sector meeting agreed to continue to support the proposed changes to NCWM Publication 14 that would allow the type evaluation of a MWT intended for use as a replacement or retrofit component in an existing BCS system. Mr. Darrell Flocken informed the group that the Evaluation Checklist has been included in the 2015 edition of NCWM Publication 14.

2. Review of NCWM Publication 14 List of Sealable Parameters for BCS Systems

Source:
USNWG on Belt-Conveyor Scales.

Proposal:
To review and further develop (if necessary) a list of features associated with a belt-conveyor scale system (and weigh-belt systems) that will categorize those features as either sealable or non-sealable.

Background:
The following table was developed during the 2009 - 2010 NTETC BCS Sector meetings. The table was then incorporated in the 2011 edition of Publication 14. At that time NTEP laboratories were asked to report back to the Sector with comments and recommended amendments for improvement. This item was included on the Sector's meeting agenda in 2014 and the members were informed that there had been no opportunities to use the table as part of an evaluation.

In addition, during the 2014 meeting, it was recommended that the function of enabling a belt-profiling to establish a zero condition of a BCS system should be added as a sealable parameter in the table. Other features were considered for inclusion on this listing during that meeting; however, there was no consensus among the Sector members to make further revisions.

It has been reported to NIST, OWM that devices have recently been or possibly will be submitted in the near future for type evaluation, which could offer an opportunity to test the usefulness of the following table.

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 NIST Handbook 44 for the applications for which the device is to be used).*	

Discussion:
At the 2015 BCS Sector meeting, this item was reviewed by the group to consider whether any additional features should be included or deleted from the above table. Participants of the meeting considered the possibility of additional features to be sealed including the function of a chart recorder. The Sector members recognized that the documentation provided by the chart recorder in a system is an important part of an official inspection and that those records should represent the actual performance of that system. Mr. Chuck Andrews added that since the chart recorder on a system is required by NIST Handbook 44, there is some justification for requiring the functioning of that component to be sealed.

Other members of the Sector present at the meeting questioned how the chart recorder could be sealed and stated that it is not the peripheral devices in the system that need to be sealed but instead it is only the MWT and its functions that should be sealed.

The group considered communications between the MWT and other elements in the system as sealable parameters although, to some in the Sector, "communications" is a general term, and its meaning in this context is vague. Mr. Flocken agreed that the term "communications" is vague and suggested that devices not having "intelligence" and that would not impact the metrological features and functions of the system would not have to be sealed.

Mr. Flocken also stated that the table lists *typical* features and that it is up to the evaluator to do a thorough examination. If anything about that system turns out to be a security risk, then sealing of the affected parameters must become an issue regarding the device's certification.

Conclusion:
The Sector agreed to propose one additional modification of the table that would aid in clarifying the statement regarding communications in the table. The participants of the 2015 meeting agreed to the addition of the wording "…with no metrological influence" at the end of the statement pertaining to communications in the right-hand column containing non-sealable features as shown in the following table. No further changes to the list were recommended at this time.

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 overcapacity 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~~)~~ **with no metrological influence)**
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 NIST Handbook 44 for the applications for which the device is to be used).*	

B. Linearization Feature for BCS:

Source:
USNWG on Belt-Conveyor Scales

Proposal:
Develop recommended test procedures for NCWM Publication 14, *Belt-Conveyor Scales* to evaluate the use of any linearity correction feature when used in a belt-conveyor scale system.

Background:
Many manufacturers and service agents of belt-conveyor scales have supported the use of electronic instruments equipped with a linearity correction feature (i.e., multiple point calibrations) to reduce errors in device indications that deviate from a linear pattern. It has been reported by some Sector members that this practice may be considered as non-compliant by some weights and measures jurisdictions.

At the 2011 BCS Sector Meeting, some members agreed to participate in a sub-committee to develop a draft of recommended test procedures that would be submitted to the NTEP Committee as proposed changes within NCWM Publication 14.

This sub-committee conducted a teleconference (June 7, 2012) and agreed that the evaluation of a linearity correction feature could be performed either in controlled laboratory conditions or in a field installation. The sub-group also agreed that this feature would need to be a sealable function within the instrument. Some of the specific points regarding this issue considered by the sub-group in June 2012 included:

- The correction factor (linearization factor) must be applied at a minimum of three points or flow rates.
- It is to be determined if there is to be a limitation on the amount of correction permitted. If there is to be a limit established, the sub-group suggests that a limit of ± 0.4 % of scale capacity may be appropriate.
- The group determined that lab testing should be performed at pre-specified percentages of device capacity to ensure the feature is capable of performing correctly throughout the operating range of the device.
- The group recommended that testing be performed using predetermined correction factors. For instance:
    - flow rates equal to 25 %, 50 %, 75 % and 90 % of full scale;
    - tests for loading of ± 0.5 %, ± 1 %, ± 1.5 % and ± 2 % of full scale at each flow rate.

At the 2014 BCS Sector meeting, the members discussed specifics about this issue including what value could be established as an appropriate limit for the amount of correction that would be allowed by a linearization correction feature. It had been suggested by the sub-committee that a limit of ± 0.4 % of scale capacity would be an appropriate value. Some members agreed in general with this limit, however others suggested that this restriction is arbitrary and that it may be overly prescriptive to place any limitation on the amount of correction allowed to the linearity.

While considering what should be included as elements included in a test procedure, the Sector could not agree on certain points including what tolerance should be applied to the output of a system when linearization is being corrected through the use of this feature.

It was agreed at the 2014 meeting that this item needs to be further developed. The original sub-group formed to develop this item agreed to continue work on this item and to produce a draft test procedure that would be circulated for review by the Sector.

Discussion:
At the 2015 NTEP BCS Sector meeting, the participants were informed that no draft for a test procedure has been developed at this time. The group was reminded that the Sector had generally agreed that it was possible to

perform an evaluation of a linearity correction feature either in a laboratory setting or in the field, once the MWT had been installed in a system. The Sector members were asked if there was any need for further test procedures to be developed recognizing that this feature could be evaluated simply by performing a required multiple flow rate material test.

Many of the participants of the 2015 meeting agreed that the use of a software-based feature such as linearity correction will mask defects or performance problems exhibited by the BCS system it is used on and that they would prefer that the cause of the substandard performance be corrected. Other members however, pointed out that linearity correction is commonly used on other types of devices such as vehicle scales.

Mr. Peter Sirrico stated that while this feature may be an asset, he would not support a linearity correction function with no limitation to the amount of correction performed.

There was additional discussion in general terms that included: how many points are used in the correction; and how much, if any, influence correction at a certain point has on an adjacent correction point. It was also noted that the group had not established whether a linearity correction is applied to the output of a load cell or the totalization of material at different flow rates when considered in context of belt-conveyor scale systems. The Sector agreed that in that context, any correction in linearity would most likely be applied to the totalization of material at different flow rates. The participants of the 2015 meeting also agreed that it is the responsibility of the manufacturer of BCS to specify the conditions that must be met regarding the conveyor system that will promote satisfactory operation of the weighing device. Those specifications should be met by the owner/operator prior to the installation of the BCS.

Conclusion:
The Sector members agreed that there is no specific test procedure needed at this time for the evaluation of this type of feature and that an appropriately performed official test (including material testing at different flow rates), is needed to determine that this function is working properly. The members also agreed not to recommend any changes for the NCWM Publication 14 unless there is a determination made that an alternative method to evaluate linearization in a lab for NTEP is needed.

Additional consideration may be given to this item in the future regarding specific test procedures needed, correction limitations, etc. if the Sector determines it is needed.

C. Conveyor Belt Profiling:

Source:
USNWG on Belt-Conveyor Scales

Proposal:
Develop recommended test procedures for NCWM Publication 14, *Belt-Conveyor Scales* to evaluate the use of a belt profiling feature to provide a zero-load reference when used in a belt-conveyor scale system.

Background:
This means of establishing a zero-condition prior to a totalization operation involves the ability of the weighing device to establish "tare" weight values associated with distinct individual segments of the belt and synchronizing the application of those values to the movement of the belt segments over the scale portion of the conveyor. Many Sector members have agreed that this feature should receive some level of evaluation, and that at a minimum, the ability to enable or disable any belt profiling feature should be protected by some form of security seal.

In addition, NIST OWM has received inquiries seeking guidance on whether this type of feature is permitted under U.S. standards. It is also being reported by some members of the USNWG BCS that some regulatory field officials will not issue an approval for devices equipped with this feature when it is not listed as a standard feature or an option on the NTEP Certificate of Conformance.

Members at the 2011 BCS Sector meeting also concluded that it may be preferable to have the analysis and necessary action(s) for the consideration of belt profiling features taken on by the same work group formed under the previous agenda item (Item B. Linearization Feature for BCS).

During the 2014 meeting, the BCS Sector was informed that the same sub-group which was assigned to develop procedures for verifying the operation of a linearization correction had also been assigned to develop a procedure for testing the function of belt profiling. No draft procedures have been developed at the time of the 2014 BCS Sector meeting.

Similar to the previous item (linearization correction), the sector members acknowledged that this feature could readily be tested in the field and would most likely be more costly to test in a laboratory setting. All the sector members agreed that this feature must be one protected by a type of security seal.

At the 2014 BCS Sector meeting, the sub-group asked to develop test procedures for the evaluation of this type of feature was assigned to continue work on this and to have a draft available to be presented to the Sector at its next meeting for review. Since this draft test procedure has not been finalized and distributed to the members as planned, the Sector will need to consider what additional steps are to be taken to resolve this issue.

Discussion:
The comments heard at the 2015 NTEP BCS meeting regarding this item were similar to those made during the discussion on the previous item during the meeting. The use of a belt profiling feature was supported by some participants and opposed by others within the Sector. Many who expressed opposition for the use of this feature on commercial devices cited the same concerns that were mentioned in regard to linearity correction. Those members stated their belief that the use of belt profiling to establish a zero-reference condition could mask inconsistencies in the composition and condition of the conveyor belt.

The Sector members generally acknowledged that those who support the use of this feature also support the testing of BCS using a minimum test load of less than the amount of material totalized in a full belt revolution. The use of belt profiling would facilitate this practice in that a zero-reference value could be established with less than a full revolution of belt travel. The participants of the 2015 meeting also acknowledged that some sector members that are ardent supporters of the use of belt profiling were not present at the 2015 meeting and therefore their input would not be heard during this discussion. This was a concern to the participants who were reluctant to develop any conclusions without the input of those that were not present at the meeting and in the absence of those members that are considered experts on the operation of this type of feature.

Conclusion:
The Sector members present at the 2015 meeting agreed that this issue should be tabled until a future meeting when additional members are present who are considered experts in this area. This item will be considered during a future meeting of the Sector.

II. NEW ITEMS

A. Proposed changes to *NCWM Publication 14 - Belt-Conveyor Scales*

The following amendments are being proposed for the 2015 edition of NCWM Publication 14, *Belt-Conveyor Scales* to reflect changes adopted in 2014 to the NIST Handbook 44, *Section 2.21. Belt-Conveyor Scale Systems Code*.

1. NCWM Publication 14 Section 9.7.9.

Source:
USNWG on Belt-Conveyor Scales

Proposal:
This proposed change would eliminate this item currently included on the checklist and would align NCWM Publication 14 with the most current edition of NIST Handbook 44.

Background:
A change to NIST Handbook 44, *Belt-Conveyor Scale Systems Code*, paragraph was adopted in 2014 as follows:

> **UR.1.2. Conveyor Installation.** – The design and installation of the conveyor leading to and from the belt-conveyor scale is critical with respect to scale performance. The conveyor can be horizontal or inclined, but if inclined, the angle shall be such that slippage of material along the belt does not occur. Installation shall be in accordance with the scale manufacturer's instructions and the following:
>
> ~~***(h) Conveyor Length. The conveyor shall be no longer than 300 m (1000 ft) nor shorter than 12 m (40 ft) from head to tail pulley.***~~
> ~~***[Nonretroactive as of January 1, 1986]***~~

This adopted change eliminated prescribed limits on the minimum and maximum lengths for conveyors used in belt-conveyor scale systems.

To align the content of NCWM Publication 14*, Belt-Conveyor Scales* with the current NIST Handbook 44 the following change is recommended.

> **9.7.8.** There shall be no tripper or movable head pulleys in the conveyor.
>
> ~~**9.7.9. The conveyor shall be no longer than 1000 ft (300 m) or shorter than 40 ft (12 m) from head to tail pulley.**~~
> ~~**[Nonretroactive as of January 1, 1986]**~~
>
> 9.7.~~**10**~~**9**. Conveyor stringers at the scale and for not less than 20 ft (6 m) before and beyond the scale shall be continuous or securely joined and of sufficient size and so supported to eliminate relative deflection between the scale and adjacent idlers when under load.
>
> ***… Subsequent paragraphs to be renumbered as needed.***

Discussion/Conclusion:

During the 2015 NTEP BCS Sector meeting, there was a limited discussion regarding the implied result expected from the elimination of this item from the NTEP Publication 14 checklist. Several Sector members asked for confirmation whether this action would affect a NTEP evaluation on weigh-belt type weighing systems. The Sector agreed that this change would have a significant impact on this type of device.

The Sector agreed with this suggested change, and that no further actions are necessary.

2. NCWM Publication 14 Section 9.7.1.

Source:
USNWG on Belt-Conveyor Scales

Proposal:
It is recommended that Section 9.7.1. of NCWM Publication 14, *Belt-Conveyor Scales* be amended as shown below.

9.7.1. ~~**If the belt length is such that a take-up device is required, this device shall be of the counter-weighted type for either vertical or horizontal travel.**~~ **Any take-up device shall provide constant and consistent tension for the belt under all operating conditions.**

9.7.1.1. Indicate the Type: **Counterweighted:** ☐ Vertical ☐ Horizontal **Other:** ☐

Background:
This proposed change would align NCWM Publication 14 with a change adopted in NIST Handbook 44 in 2014 by removing prescriptive language from a requirement [UR.1.2.(d)] pertaining to the means by which a conveyor system uses to maintain tension on the conveyor belt. The change appearing in the 2015 edition of NIST Handbook 44, *BCS Systems Code is* shown below.

UR.1.2. Conveyor Installation. – …

…

(d) Take-up Device. – ~~**If the belt length is such that a take-up device is required, this device shall be of the counter-weighted type for either vertical or horizontal travel.**~~ **Any take-up device shall provide constant and consistent tension for the belt under all operating conditions.**

(Amended 2014)

Discussion/Conclusion:
The Sector agreed that the change proposed to NCWM Publication 14 under 9.7.1. is justified although some in the group questioned whether the changes being recommended for the sub-paragraph 9.7.1.1. is necessary. The NIST Technical Advisor to the Sector explained that NCWM Publication 14 already contains subparagraph 9.7.1.1. with check boxes included for a selection of "vertical" or "horizontal" and this change would make these optional. Also, optional with this proposal would be the use of neither vertical or horizontal "counterweighted" type of take-up, therefore a checkbox for "other" is being proposed. The Sector agreed with these recommendations and no further changes were proposed.

B. NTEP Belt-Conveyor Scale Sector Chair Position

Proposal/Background:

The current Chair of the NTEP Belt-Conveyor Scale Sector, Mr. Bill Ripka, has indicated that he will no longer be able to serve in this capacity. Mr. Ripka's resignation creates a vacancy that sector members will need to address by nominating a replacement.

Source:
NTEP Belt-Conveyor Scale Sector

Discussion/Conclusion:
Mr. Darrell Flocken (NTEP Specialist) provided the sector members with details regarding the procedure involved in filling a vacant Sector Chair position. The Sector was informed that this procedure should include a nomination of candidates for that position by the sector members and that this process could be done via e-mail ballot. The

NIST Technical Advisor informed the Sector members that he would initiate the balloting following the 2015 meeting. Once the balloting was completed, the results would be forwarded to the NTEP administrator for further action.

NIST Technical Advisor's note:
Following the Sector's 2015 meeting, the Sector members were asked to participate in a nomination of candidates for the position of NTEP BCS Sector Chairperson through an exchange of e-mails. Following the nomination process, Sector members were then asked to respond to a ballot that would identify their choice as Chair. The results of that ballot were that Mr. Peter Sirrico was identified as the Sector members' selection to fill the vacant Sector Chair position. Results were then forwarded to the NTEP Administrator.

III. ATTENDANCE:

Name	Organization	Telephone	E-mail
Art Amsler	Arcadia Controls	412 841-2708	artarcadia.@aol.com
Peter Sirrico	Thayer Scale	781 826-8101	psirrico@thayerscale.com
Mike Laffey	Laffey Equipment	314 427-7414	mlaffey@laffeyequipment.com
Chuck Andrews	Thermo Fisher Scientific	763 783-2699	chuck.andrews@thermofisher.com
Jason Kukachka	Thermo Fisher Scientific	763 783-2566	jason.kukachka@thermofisher.com
Zacharias Tripoulas	State of MD NTEP Lab	410 841-5790	Zacharias.tripoulas@maryland.gov
Darrell Flocken	NCWM/NTEP	614 620-6134	darrell.flocken@ncwm.net
James Alexander	DTE Energy	313 268-3169	alexanderj@dteenergy.com
Haukur Johannesson	Marel Seattle	206 926-5486	haukur.johannesson@marel.com
Al Page	State of Montana (retired)	406 861-0534	awp8866@gmail.com
John Barton	NIST	301 975-4002	john.barton@nist.gov

Appendix C

National Type Evaluation Program (NTEP)
Grain Analyzer Sector Summary

October 2015

INTRODUCTION

The charge of the Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," Sections 1.10. General Code, 5.56.(a) and 5.56.(b) Grain Moisture Meters, and 5.57. Near-Infrared Grain Analyzers. The Sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14, "Technical Policy, Checklists, and Test Procedures" for national type evaluation.

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

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is the policy of the National Institute of Standards and Technology (NIST) to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references in U.S. customary units.

Table A
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Table B
Glossary of Acronyms and Terms

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

Details of All Items
(In order by Reference Key)

1. August 2015 Grain Analyer Sector Meeting

On June 30, 2015, Mr. Jim Truex sent an e-mail to the Grain Analyzer (GA) Sector and other interested parties to notify them that the August 2015 GA Sector meeting would not be held due to the limited number of NCWM Publication 14, and NIST Handbook 44 items on the August 2015 tentative agenda item list. Since most of the tentative items for the August 2015 agenda were updates or reports of activities, the Sector Chair recommended that the 2015 GA Sector meeting not be held and agreed that a Grain Analyzer Sector Report, which contained the updates and reports of activities, be distributed to the GA Sector for review and comment. The Technical Advisor, Ms. Diane Lee developed a report and comment form that was distributed to GA Sector members for review. GA Sector members are were to review the 2015 GA Sector report and provide comments.

2. Report on the 2015 NCWM Interim and Annual Meetings

The 2015 NCWM Iterim Meeting was held January 18 - 21, 2015, in Daytona Beach, Florida. At that meeting, no recommended amendments to NCWM Publication 14 for grain analyzers were provided by the Sector to the NTEP Committee. The 2015 NCWM Annual Meeting was held July 19 - 23, 2015, in Philidelphia, Pennsylvania. There were no Grain Analyzer Sector Voting items on the annual agenda. One Grain Analyzer Sector developing item appeared on the S&T agenda, **Item 360-4, Appendix D – Definitions: Remote Configuration Capability.** See Grain Analyzer Agenda Item 5, for details.

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

Ms. Cathy Brenner and Mr. Jason Jordan, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that are enrolled in the Phase II for the 2015 harvest. There are six models enrolled for the 2015 harvest.

The six models:

1. DICKEY-john Corp. - GAC2000 (NTEP Version), GAC2100a and GAC2100b2100
2. DICKEY-john Corp. - GAC2500-UGMA
3. Foss North America - Infratec 1241
4. Perten Instruments Inc. - AM5200 and AM5200-A (The AM5200-A is UGMA Certified.)
5. Perten Instruments Inc. - IM9500
6. The Steinlite Corporation – SL95

4. Review of OCP (Phase II) Performance Data For Moisture and Test Weight per Bushel

At the Sector's August 2005 meeting, it was agreed that comparative OCP data identifying the Official Meter and listing the average bias for each NTEP meter type should be available for annual review by the Sector. Accordingly, Ms. Brenner, GIPSA, the NTEP Participating Laboratory for Grain analyzers, provided data for inclusion in the 2015 Grain Analyzer Sector Report showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2012 - 2014) using calibrations updated for use during the 2015 harvest season.

The 2012 - 2014 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

https://www.ncwm.net/_resources/dyn/files/75399703z4f717b59/_fn/TW+Comparision+Charts.pdf

At the August 2012 Sector Meeting, it was agreed that TW comparison and correlation charts should be prepared for the three grains that are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes, and should be limited to Air Oven reference values less than 20 % moisture. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Accordingly, Ms. Brenner, GIPSA, the NTEP Participating Laboratory for Grain analyzers, prepared data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. Ms. Brenner provided this information for the Grain Analyzer Sector 2015 report. This data is based on the last three crop years (2012 - 2014) using calibrations updated for use during the 2015 harvest season.

The 2012 - 2014 TW comparison and correlation charts Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

https://www.ncwm.net/_resources/dyn/files/1081742zef27d924/_fn/TW+2013+Sector+Meeting.pdf

5. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing Item 360-7)

Source:
NTETC Grain Analyzer Sector

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56.(a) of NIST Handbook 44 lists acceptable methods of sealing for various categories of GMMs. When the Sector first recommended adding the table to NIST Handbook 44 at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information " …sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item Under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:

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**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]

(Added 1993) (**Amended 20XX**)

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

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

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote

configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode, the USB flash drive can be removed from the GMM.

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

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

At its 2012 meeting, the Grain analyzer Sector agreed by consensus to accept the Item Under Consideration and recommended forwarding this item to the S&T Committee for consideration.

2012 WWMA Annual Meeting: Ms. Juana Williams (NIST OWM) supported the intent. She talked about this item in conjunction with Item 356-1, S.2.5. Categories of Device and Methods of Sealing. This is a complex item affecting multiple other devices; therefore, the proposal requires further consideration. The language in the proposal to amend the definition of remote configuration capability is confusing. The Committee believes the current definition already allows the use of remote configuration devices and allows the flexibility desired. The ramifications of changing the definition could affect other devices in NIST Handbook 44. WWMA did not forward this item to NCWM.

2012 SWMA Annual Meeting: There were no comments. After reviewing the proposal and considering the potential impact on other device types, the Committee recommended this as a Developing Item. The Committee asks that the Sector continue to obtain input on the definition and the impact the changes would have on other device types. SWMA forwarded the item to NCWM, recommending it as a Developing Item and assigning its development to the Grain Analyzer Sector.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST, OWM). OWM suggests the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibrations intended for use with the GMM, inserted in the device (as was described by the Grain Analyzer Sector). As such, OWM notes that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggests that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 "Report of the 77th National Conference on Weights and Measures" (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.

The Committee also heard comments fromMr. Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus, it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

At their 2013 Annual Meetings, both NEWMA and CWMA supported this as a "Developing" item. NEWMA heard from NIST who encouraged members to consider this work as it applies to all device types.

On the 2013 NCWM Online Position Forum, one Government representative indicated a neutral position on this item with no additional comments.

At the 2013 NCWM Annual Meeting Open Hearings, the Committee heard comments from Ms. Juana Williams who reiterated OWM's comments from the 2013 Interim Meeting, suggesting it may be appropriate to develop separate requirements to address new and future technologies, which can be remotely configured with removable media. OWM plans to develop draft language and ask for input from the various Sectors at their upcoming meetings. Ms. Williams also noted the suggestion made at the 2013 NCWM Interim Meeting by Mr. Karimov, LC, speaking on behalf of the MMA, that a provision might be added to the General Code to address this type of equipment.

Ms. Julie Quinn (Minnesota) agreed with OWM's comments and indicated support for possibly including requirements in the General Code to address newer and emerging technologies. Mr. Karimov, speaking on behalf of MMA, concurred with this suggestion.

At the August 2013 Grain Analyzer Sector Meeting, OWM had not drafted a definition for remote configuration capability to address devices that are programed using removable media such as SD cards or flash drives. During the August 2013 GA Sector meeting, the Sector discussed other ways devices can be remotely configured that should also be considered when drafting a definition for remote configuration capability to address these devices.

Mr. Hurburgh mentioned that we also need to consider devices that use cloud computing to remotely configure a device and suggested that we consider the various ways a device can be remotely configured.

The Sector agreed that OWM should develop a proposal for a definition for remote configuration capability, which addresses devices using removable media such as SD cards, flash drives or other methods not covered by the existing definition.

At the 2013 Weighing Sector meeting, OWM requested members of the Sector help identify the various types of removable storage media (e.g., USB flash drives, SD memory cards, etc.) currently in use with weighing equipment and to describe the functionality of that media. The information provided would likely be used by OWM to develop some draft proposals to amend NIST Handbook 44 to adequately address the security of the metrologically significant parameters of devices using such media.

The following feedback was provided by members of the Sector to OWM:

- I am not in favor of changing standards for advances in technology.
- Both SD cards and USB Flash drives can be used for data transfer and data storage. It would be difficult to address all devices by changing the General Code.
- There are other technologies besides SD and Flash digital storage devices that must be considered (e.g., Eprom and EEE, etc.).
- Several members commented that they felt it would likely be necessary to separate requirements in the various codes of NIST Handbook 44.
- It is not reasonable to expect manufacturers to share the technologies used in a public forum such as this meeting and it might be better to speak individually with representatives of the different manufacturers.

At the end of the discussion, a few WS members offered to provide technical expertise to assist OWM in answering any questions that might arise during future development of proposed requirements to address this issue.

At the 2013 Measuring Sector Meeting, the Sector did not support the language "may or may not be necessary" because this phrase changes the category of what is considered "remote configuration capability." The Sector agreed that if the card (or other removable device) needs to be a part of the measuring device for normal operation, then the card is effectively part of the device; in that case, the measuring device is a Category 1. If the card is only used for configuration or calibration and is not necessary for the operation of the measuring device, the measuring device is a Category 2. The Sector discussed whether or not additional guidance might be needed on what is covered by each sealing category; however, the Sector concluded that the definitions are adequate as currently written.

At the August 2014 Grain Analyzer Sector meeting, the Sector considered the responses from NIST OWM, SWMA, WWMA, Measuring Sector, and Weighing Sector concerning devices that use SD cards, flash drives, or other methods for configuration. The Grain Analyzer Sector agreed that the current proposed language may be confusing and agreed to Withdraw their proposal for changes to the definition of remote configuration.

Update for the 2015 Grain Analyzer Sector Report:
At the 2015 NCWM Interim Meeting S&T open hearings, Ms. Tina Butcher (OWM) requested that the Committee reassign this item to OWM noting that the issue identified by the Grain Analyzer Sector had not been resolved. Ms. Butcher noted that a gap still exists concerning the sealing of equipment in which the sealable parameters of that equipment can be changed by use of a removable digital storage device. She stated that members of OWM's Legal Metrology Devices Program (LMDP) have agreed to take up this issue after the 2015 Interim Meeting in hopes of being able to develop a proposal that addresses the issue and be able to report on its progress at the next NCWM Conference.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated he would be willing to work with OWM on a proposal to address this issue.

The SMA commented that it looks forward to further clarification of this item.

The Committee agreed to reassign this item to OWM for additional development based on OWM's assessment there remains an unresolved issue involving the sealing of equipment using removable digital storage devices.

At the 2015 NCWM Annual Meeting, Ms. Tina Butcher provided an update to the Committee on OWM's progress in developing this item. Ms. Butcher noted that OWM's Legal Metrology Devices Program (LMDP) had met several times since the 2015 Interim Meeting to work on this issue. Rather than attempting to modify current sealing requirements, which never envisioned this method of adjustment, the LMDP propose creating a separate set of sealing requirements for this technology. Members of the LMDP developed a draft General Code paragraph they believe will address the sealing of devices using this technology to make adjustments. The LMDP requests the following draft General Code paragraph be included in this item to begin generating feedback to assist in further development of this item:

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

Ms. Butcher also noted that OWM plans to propose modifications to a number of the individual device codes in NIST Handbook 44 to reference the new General Code sealing requirement. The following draft example requirement was developed by the LMDP and included in OWM's written analysis of this item, to provide an indication of how some of the device codes in NIST Handboook 44 will need to be amended that this type of sealing can be addressed:

Proposed changes to Scales Code paragraph S.1.11. Provision for Sealing:

S.1.11. Provision for Sealing.

S.1.11.1. Devices Adjusted Using a Removable Digital Storage Device. - For those devices adjusted using a removable digital storage device, G-S.8.2. applies.

S.1.11.2. All Other Devices.- Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.
[Nonretroactive as of January 1, 1979]

(b) 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.
[Nonretroactive as of January 1, 1990]

(c) Audit trails shall use the format set forth in Table S.1.11.
[Nonretroactive as of January 1, 1995]

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.
(Amended 1989, 1991, and 1993)

As a final comment regarding this item, Ms. Butcher indicated that devices using other means to access adjustments would continue to be addressed by current sealing requirements.

2014 Regional Association Meetings:
At its 2014 Interim Meeting, CWMA did not receive any comments on this item and believes the item is sufficiently developed. CWMA recommended that the item be a Voting item on the NCWM Agenda. During the 2015 CWMA Annual Meeting, the SMA reported that it looks forward to the further clarification of this item, yet it has concerns about changing metrological parameters without proper re-sealing. The CWMA agreed to recommend the item move forward as a Developing item noting that it supported the continued development of this item.

During open hearing at the 2014 WWMA Annual Meeting, an industry representative questioned whether or not this item would affect definitions for other device types. An NCWM representative expressed the opinion that it does affect other devices. The WWMA recommended that this item remain as a Developing item to allow additional input and consideration.

At its 2014 Annual Meeting, SWMA recommended that this item be withdrawn noting it believes this item is not necessary and the existing definition in Appendix D of NIST Handbook 44 is adequate.

At its 2014 Interim Meeting, NEWMA recommended this item be Withdrawn noting it believes the existing definition in Appendix D of NIST Handbook 44 is adequate. At the 2015 NEWMA Annual Meeting, no comments were received on this item. NEWMA agreed to recommend the item move forward as a Developing item as OWM continues its work on the proposal.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to **http://www.ncwm.net/meetings/interim/publication** to review these documents.

The GA Sector is encouraged to review the OWM proposal for changes to NIST Handbook 44 to address devices that use removable storage devices and provide any additional feedback.

6. Status of Interagency Agreement

Source:
Cathy Brenner, USDA, GIPSA
G. Diane Lee, NIST, OWM

Background/Discussion: The current Interagency Agreement is the fourth five-year agreement of the on-going calibration program. The agreement was signed in March 2010 and runs through analysis of the 2014 crop and issuance of the 2015 Certificates of Conformance. Thus, we have just started the fifth year of the current agreement. It should be noted that annual calibration activities occur in two government fiscal years and are better defined by a starting date of July 1.

GIPSA noted in order to provide the standardization services to the commercial system, GIPSA TSD discussed options for improving the process and reducing the burden on all parties. At the August 2013 Grain Analyzer Sector meeting, GIPSA sought input from the Sector on limiting the number of samples tested to a maximum of 10 samples per 2 % moisture interval for all grains. It was noted that fewer samples are needed to calibrate the new UGMA meters It was also noted that GIPSA's fees are increasing and with no changes to the program the manufacturers' fees will increase. During the discussion one alternate proposal was to base the cost on one-third shared cost of the program where GIPSA and NIST cover one-thrid the cost of the program each and manufacturers split one-third the cost. It was noted during the meeting that due to budget issues GIPSA and NIST will likely not be able to fund more than the $30,000 per year.

Ms. Brenner agreed to review the statistics to determine how the sample size of up to 30 samples per 2 % moisture interval per grain type was established and to investigate the impact of reducing the sample size to 10 samples per 2 % moisture interval per grain type. The Sector agreed by consensus to reduce the number of samples used in the ongoing calibration program for each 2 % moisture range per grain type as long as the integrity of the program is not affected.

A fifth five-year Interagency Agreement has been drafted based upon GIPSA's base cost per NTEP only meters above the cost to maintain the official moisture meters. The agreement is currently being forwarded for appropriate signatures at NIST and then to GIPSA. The interagency agreement includes tables of the base cost per NTEP only meter and descriptions for funding calculations and fee tables for each year of the agreement. The fee tables are based on the reduced number of samples per 2 % moisture interval.

At the 2014 Grain Analyzer Sector Meeting, Ms. Cathy Brenner reported that she found no statistical impact in reducing the sample size in the ongoing calibration program from 30 samples to 10 samples per 2 % interval. During

the review of the ongoing calibration fee tables, Mr. Andy Gell, Foss North America pointed out that the cost per meter in the ongoing calibration program would be decreased due to the reduction in the number of samples per 2 % moisture interval. Mr. Gell then noted that the tables showed an increase in the cost per meter. After further review by the Sector an error was found in calculating the cost per meter and the tables were corrected.

2015 Grain Analyzer Sector Report Update:
The 2015 - 2019 Interagency Agreement between USDA, GIPSA, and NIST, OWM was cleared and signed in July 2015. The fees for the ongoing calibration program (Phase II program) are included in the tables below for each year of the program.

Table 1. Description of Program Fee Schedule Acronyms and Funding Source Calculations

Key and/or Funding Source	Description
O	Number of GIPSA official meters
N	Number of NTEP only meters (non-GIPSA official meters)
BC	FY Base Cost per NTEP only Meters in the ongoing calibration program
TP	Total NTEP Program Cost = N x BC
TM	(O + N) Total Meters including Official Meters
NIST	National Institute of Standards and Technology Contribution = TP /3 up to and not more than 30,000
GIPSA	Grain Inspection Packers and Stockyards Administration Contribution = TP /3 up to and not more than 30,000
MCMT	Manufacturers Cost per Meter Type = TP-NIST Contribution - GIPSA Contribution

Table 2. Ongoing Calibration Program Base Cost per NTEP only meter per Fiscal Year

Fiscal Year (FY)	NTEP On-going Calibration Program Base Cost per NTEP only meter (above GIPSA costs to maintain the official moisture meters) (BC)
2015	$17,678
2016	$18,064
2017	$18,453
2018	$18,513
2019	$18,576

NTEP On-going Calibration Program Fee Schedule for Year 2015							
(1) Total Meters (including official meter) (TM) = O + N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = N × BC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total Funding from all Mfg's Meter Types =TP – NIST − GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP – NIST − GIPSA)/TM
3	1	$ 17,678	$ 17,678	$ 5,893	$ 5,893	$ 5,893	$ 1,964
4	2	$ 17,678	$ 35,356	$ 11,785	$ 11,785	$ 11,785	$ 2,946
5	3	$ 17,678	$ 53,034	$ 17,678	$ 17,678	$ 17,678	$ 3,536
6	4	$ 17,678	$ 70,712	$ 23,571	$ 23,571	$ 23,571	$ 3,928
7	5	$ 17,678	$ 88,390	$ 29,463	$ 29,463	$ 29,463	$ 4,209
8	6	$ 17,678	$ 106,068	$ 30,000	$ 30,000	$ 46,068	$ 5,759
9	7	$ 17,678	$ 123,746	$ 30,000	$ 30,000	$ 63,746	$ 7,083
10	8	$ 17,678	$ 141,424	$ 30,000	$ 30,000	$ 81,424	$ 8,142

NTEP On-going Calibration Program Fee Schedule for Year 2016							
(1) Total Meters (including official meter) (TM) = O + N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = N × BC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total Funding from all Mfg's Meter Types =TP – NIST − GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP – NIST − GIPSA)/TM
3	1	$ 18,064	$ 18,064	$ 6,021	$ 6,021	$ 6,021	$ 2,007
4	2	$ 18,064	$ 36,128	$ 12,043	$ 12,043	$ 12,043	$ 3,011
5	3	$ 18,064	$ 54,192	$ 18,064	$ 18,064	$ 18,064	$ 3,613
6	4	$ 18,064	$ 72,256	$ 24,085	$ 24,085	$ 24,085	$ 4,014
7	5	$ 18,064	$ 90,320	$ 30,000	$ 30,000	$ 30,320	$ 4,331
8	6	$ 18,064	$ 108,384	$ 30,000	$ 30,000	$ 48,384	$ 6,048
9	7	$ 18,064	$ 126,448	$ 30,000	$ 30,000	$ 66,448	$ 7,383
10	8	$ 18,064	$ 144,512	$ 30,000	$ 30,000	$ 84,512	$ 8,451

NTEP On-going Calibration Program Fee Schedule for Year 2017							
(1) Total Meters (including official meter) (TM) = O + N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = N × BC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total Funding from all Mfg's Meter Types =TP – NIST − GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP – NIST − GIPSA)/TM
3	1	$ 18,453	$ 18,453	$ 6,151	$ 6,151	$ 6,151	$ 2,050
4	2	$ 18,453	$ 36,906	$ 12,302	$ 12,302	$ 12,302	$ 3,076
5	3	$ 18,453	$ 55,359	$ 18,453	$ 18,453	$ 18,453	$ 3,691
6	4	$ 18,453	$ 73,812	$ 24,604	$ 24,604	$ 24,604	$ 4,101
7	5	$ 18,453	$ 92,265	$ 30,000	$ 30,000	$ 32,265	$ 4,609
8	6	$ 18,453	$ 110,718	$ 30,000	$ 30,000	$ 50,718	$ 6,340
9	7	$ 18,453	$ 129,171	$ 30,000	$ 30,000	$ 69,171	$ 7,686
10	8	$ 18,453	$ 147,624	$ 30,000	$ 30,000	$ 87,624	$ 8,762

NTEP On-going Calibration Program Fee Schedule for Year 2018							
(1) Total Meters (including official meter) (TM) = O + N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = N × BC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	7) Total Funding from all Mfg's Meter Types =TP – NIST − GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP – NIST − GIPSA)/TM
3	1	$ 18,513	$ 18,513	$ 6,171	$ 6,171	$ 6,171	$ 2,057
4	2	$ 18,513	$ 37,026	$ 12,342	$ 12,342	$ 12,342	$ 3,086
5	3	$ 18,513	$ 55,539	$ 18,513	$ 18,513	$ 18,513	$ 3,703
6	4	$ 18,513	$ 74,052	$ 24,684	$ 24,684	$ 24,684	$ 4,114
7	5	$ 18,513	$ 92,565	$ 30,000	$ 30,000	$ 32,565	$ 4,652
8	6	$ 18,513	$ 111,078	$ 30,000	$ 30,000	$ 51,078	$ 6,385
9	7	$ 18,513	$ 129,591	$ 30,000	$ 30,000	$ 69,591	$ 7,732
10	8	$ 18,513	$ 148,104	$ 30,000	$ 30,000	$ 88,104	$ 8,810

NTEP On-going Calibration Program Fee Schedule for Year 2019							
(1) Total Meters (including official meter) (TM) = O + N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = N × BC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total Funding from all Mfg's Meter Types =TP – NIST − GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP – NIST − GIPSA)/TM
3	1	$ 18,576	$ 18,576	$ 6,192	$ 6,192	$ 6,192	$ 2,064
4	2	$ 18,576	$ 37,152	$ 12,384	$ 12,384	$ 12,384	$ 3,096
5	3	$ 18,576	$ 55,728	$ 18,576	$ 18,576	$ 18,576	$ 3,715
6	4	$ 18,576	$ 74,304	$ 24,768	$ 24,768	$ 24,768	$ 4,128
7	5	$ 18,576	$ 92,880	$ 30,000	$ 30,000	$ 32,880	$ 4,697
8	6	$ 18,576	$ 111,456	$ 30,000	$ 30,000	$ 51,456	$ 6,432
9	7	$ 18,576	$ 130,032	$ 30,000	$ 30,000	$ 70,032	$ 7,781
10	8	$ 18,576	$ 148,608	$ 30,000	$ 30,000	$ 88,608	$ 8,861

7. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Background/Discussion:
This item is included on the Sector's agenda to provide a summary of the activities of OIML TC 17/SC 1 for the Grain Analyzer Sector and to those Sector members that participate on the U.S. National Working Group (USNWG) on grain moisture meters. In addition, the Sector is asked to review a proposal to change the Humidity test in NCWM Publication 14 to align with the OIML D 11 and IEC damp heat test procedure.

OIML TC 17/SC 1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and actual grain analysis. The Co-Secretariats (China and the United States) are working closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*. The United States completed a sixth committee draft (6th CD) of OIML R 59, which was circulated to the international project group and the U.S. National Working Group (USNWG) on grain moisture measuring devices for review and comment on March 6, 2013. The U.S. Co-Secretariat requested that the comments to the 6th CD be submitted by June 6, 2013. The U.S. Secretariat collated the U.S. and international comments to the 6th CD and these comments were reviewed at the TC 17/SC 1 meeting hosted by NIST/OWM July 23 - 24, 2013.

At the TC 17/SC 1 July 23 - 24, 2013, meeting, comments on the 6th CD were reviewed and the major discussion was harmonization of test procedures between OIML TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds* and OIML TC 17/SC 8 recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.*

At the July 2013 meeting, it was discussed that the international damp heat test (OIML D 11 and IEC) is significantly different from the NTEP Humidity test. The international test is more robust and more accurately reflects the environmental conditions an instrument is likely to encounter in field use. The damp heat test is conducted at a maximum temperature of either the manufacturer specified upper ambient temperature or 30 °C and a maximum

relative humidity of 85 %. The damp heat test is designed to evaluate the device under the environmental (temperature and relative humidity) conditions it will encounter during operation.

During the August 2013 Grain Analyzer Sector meeting, the Sector reviewed the proposal to replace the NCWM Publication 14, GMM and NIR Humidity test procedure with the OIML D 11 Damp Heat test procedure. It was noted that the proposed changes to the humidity test in NCWM Publication 14 were based on OIML D 11 requirements, Damp heat test, Severity level 1. During discussion of this item, it was mentioned that the temperature and humidity levels as specified in OIML D 11 may pose unsafe operating conditions to laboratory staff and also that grain moisture meters are not designed to operate in these extreme conditions. A question was asked if another severity level in D 11 would more closely match the testing that is currently in NCWM Publication 14 and has been used for many years in the United States. Ms. Lee reviewed OIML D 11 requirements following the meeting and found that both severity level 1 and 2 exceed the temperature and humidity levels specified in NCWM Publication 14. The Sector agreed by consensus that the OIML D 11, Damp heat test, is much too severe for grain moisture meters and that NCWM Publication 14 should not be changed to meet the requirements of OIML D 11.

The United States will develop a 7th CD that will be distributed for voting based on comments to the 6th CD, the July 2013 TC 17/SC 1 meetin,g and the GA Sector feedback from the August 2013 meeting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Lee, provided an update on the status of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* Ms. Lee reported that the United States is nearing completion of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* This document will be forwarded to the TC 17/SC 1 participating and observing countries for a vote and will also be forwarded to participants of the USNWG on Grain Moisture Measuring Devices for vote and comment.

2015 Grain Analyzer Sector Report Update:
The 7th CD on *Moisture Meters for Cereal Grains and Oilseed* was completed and forwarded to OIML TC 17/SC 1 participating and observing countries in December 2014 for a vote by the participating countries by March 2015. The 7th CD received seven yes votes and one no vote with some additional comments. The additional comments will be considered. With a majority "yes" vote from the participating countries, the document will be forwarded as a Draft Recommendation for final voting by the CIML.

8. Report on OIML TC 17/SC 8 *Protein Measuring Instruments for Cereal Grain and Oil Seeds*

Background/Discussion:
This item was included on the Sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the Grain Analyzer Sector and to those Sector members that participate on the U.S. National Working Group (USNWG) on grain protein measuring instruments. OIML TC 17/SC 8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.* Australia is the Secretariat for this Subcommittee. The third committee draft (3rd CD) for this Recommendation was circulated to the USNWG group for comments on July 3, 2012, for review and commen. Comments were requested by September 8, 2012. The U.S. comments to the 3rd CD were forwarded to the Secretariat and the Secretariat developed the 4th CD based on these comments.

The 4th CD was circulated to the USNWG on grain protein measuring instruments on April 9, 2013, and comments to the 4th CD of TC 17/SC 8 were requested by June 13, 2013. The U.S. comments to the 4th CD were forwarded to the Secretariat. The United States was requested to vote on the 4th CD and a vote of no was provided due to a number of differences in the test procedures of the OIML Recommendation for *Protein Measuring Instruments for Cereal Grain and Oil Seeds* and the OIML Recommendation 59 *Moisture Meters for Cereal Grain and Oilseeds*.

A meeting was hosted by NIST, OWM, July 24 - 25, 2013, to discuss the comments to the 4th CD for the Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. Discussions on the 4th CD dealt mostly with harmonization of testing with the 6th CD of the OIML Recommendation R 59 *Moisture Meters for Cereal Grain and Oilseeds*, software requirements, and influence quantities and test sample temperature.

At the August 2013 Grain Analyzer Sector meeting, the Sector reiterated their concerns with the OIML D 11 damp heat test and agreed that the damp heat test in OIML Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds, 4th CD should be replaced with the humidity test as written in OIML R 59 CD 6.

The TC 17/SC 8 Secretariat will distribute a 5th CD for voting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Diane Lee, NIST, OWM, provided an update on the status of the 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. The 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was sent via e-mail to the USNWG on Protein Measuring Devices on August 26, 2014, for a vote and comments. The USNWG participants were requested to provide their vote and any comments to the 5th CD by October 14, 2014. Ms. Lee encouraged the Grain Analyzer Sector members that are also participating on the USNWG to provide a vote and any comment to the 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seed.*

2015 Grain Analyzer Sector Report Update:
The United States provided a yes vote on the 5th CD of the Protein Measuring Instruments for Cereal Grain and Oil Seeds with a comment to remove the vibration test from the document. The 5th CD of the Protein Measuring Instruments for Cereal Grains and Oil Seeds received a majority "yes" vote from the participating countries. With a majority "yes" vote by the participating countries, the document was forwarded as a Draft Recommendation for final voting by the CIML. Prior to the U.S. CIML member providing the U.S. vote, Ms. Lee circulated the DR to the USNWG and requested any final comments by October 11, 2015.

9. Software Sector Items

(a) Software Identification/Marking**s**

Source:
NTETC Software Sector

Purpose:
Review and provide comment to the Software Sector reports and conclusions on software issues.

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

2015 Grain Analyzer Sector Report Update:
The Software Sector and Weighing Sector held a joint meeting in late August 2014. The two sectors agreed to the following proposal to amend Section G-S.1. of NIST Handbook 44. Revisions to NIST Handbook 44, Section G-S.1. Identification is a developing item on the National Conference on Weights and Measures Specification and Tolerences (S&T) Committee Agenda.

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation

for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ~~***not-built-for-purpose software-based software devices***~~ ***software;***
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(d) the current software version or revision identifier for not-built-for-purpose software-based devices~~,~~ **manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2020;**
~~***[Nonretroactive as of January 1, 2004]***~~
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be:

i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.
(Added 20XX)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2020]
(Added 20XX)

iii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2020]
(Added 20XX)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word

"Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). ***Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]
(Added 2006) **(Amended 20XX)**

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

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~and.~~ 2006**, and 201X**)

At their August 2014 meeting, the Weighing and Software Sectors agreed to recommend there be no changes to paragraph G-S.1.1. The Software Sector had earlier proposed changes to G-S.1.1.; however, it was decided during the joint meeting that no changes to G-S.1.1. were necessary since the two sectors had agreed the term "not-built-for-purpose software-based devices" in G-S.1.(d) would be retained.

In consideration of the advancements made, it was recommended the "Developing " status of the item be changed to "Informational." The S&T Committee rejected the recommendation.

In recognition of the progress reported and the planned future joint meeting of the Measuring and Software Sectors, the S&T Committee agreed to keep the item on its agenda as a Developing item. However, because this item has remained on S&T's agenda for several years, the Committee also agreed it would Withdraw the item if a proposal that can be presented for vote is not received before the 2016 NCWM Interim Meeting.

(b) Identification of Certified Software

Source:
NTETC Software Sector

Purpose:
Review and provide comment to the Software Sector reports and conclusions on software issues.

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

From WELMEC 7.2:

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

From OIML D-31:

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

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

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

Is there some method to give the weights and measures inspector information that something has changed?
Yes, the Category III Audit Trail or other means of sealing.

How can the weights and measures inspector identify an NTEP Certified version?
They can't without adding additional requirements like what is described here, in conjunction with including the identifier on the CC.

The Software Sector believes we should work towards language that would include a requirement in NIST Handbook 44 similar to the International Organization of Legal Metrology (OIML) requirement. 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?)

NIST Handbook 44 (This has been written into G-S.1.(d)(3)): Identification of Certified Software:

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

From NCWM Publication 14*:*

Identification of Certified Software:

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

From OIML D-31:

> Legally relevant software of a measuring instrument/electronic device/sub-assembly shall be clearly identified with the software version or another token. The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose.
>
> The identification shall be inextricably linked to the software itself and shall be presented or printed on command or displayed during operation or at start up for a measuring instrument that can be turned off and on again. If a sub-assembly/an electronic device has neither display nor printer, the identification shall be sent via a communication interface in order to be displayed/printed on another sub-assembly/electronic device.

The first sentence of the first paragraph above is already addressed in NIST Handbook 44's marking requirements.

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

> *(d) the current software version or revision identifier for* ~~***not-built-for-purpose***~~ ***software-based electronic*** *devices;*
> *[Nonretroactive as of January 1, 2004]*
> (Added 2003) **(Amended 20XX)**
>
> *(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.*
> *[Nonretroactive as of January 1, 2007]*
> (Added 2006)
>
> *(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).*
> *[Nonretroactive as of January 1, 2007]*
> (Added 2006)

(3) The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.
[Nonretroactive as of January 1, 201X]
(Added 20XX)

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

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

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

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

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

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

Other questions that are still outstanding:

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

At the 2012 NTETC Software Sector Meeting, there was some discussion as to where the terminology regarding inextricably linking the software version or revision to the software itself belonged. At the moment, it is not incorporated in the proposed text for G-S.1. NCWM Publication 14 may be a better option for the time being. This would be another item that would benefit from further explanation in a supplementary document.

One suggestion was this revision to G-S.1.d:

(d) when metrologically significant software is employed, the current software version or revision identifier, which shall be directly and inseparably linked to the software itself;**,** for not-built-for-purpose software-based electronic devices;

Alternatively, if the previously proposed new subsection G-S.1.d.3 from Item 1 is adopted, this concept could be inserted thus:

(3) The version or revision identifier shall be directly and inseparably linked to the software itself and *accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable under the following conditions:*

Several Sector Members were of the opinion that attempting to make this change at the same time as the earlier changes might be a difficult sell. Mr. Truex, NTEP Administrator, reiterated the necessity of baby steps.

In 2012, the Sector thus recommended adding the following to NCWM Publication 14 and forward to NTETC Weighing, Measuring, Grain Analyzer sectors for feedback:

Identification of Certified Software:

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

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

Also, it was decided to forward the two alternate options for adding requirements for uniquely identifying software to the individual Sectors:

One suggestion was this revision to G-S.1.d:

(d) when metrologically significant software is employed, the current software version or revision identifier, which shall be directly and inseparably linked to the software itself;**,** for not-built-for-purpose software-based electronic devices;

Alternatively, if the previously proposed new subsection G-S.1.d.3 from Item 1 is adopted, this concept could be inserted thus:

(3) The version or revision identifier shall be **directly and inseparably linked to the software itself and** *accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable under the following conditions:*

The Measuring Sector reviewed this item and had no feedback other than a statement that they support the continuing/ongoing efforts of this Sector. The Weighing Sector summary mentioned that no one opted to provide comment. They agreed to take no further action on this item, pending further action from the Software Sector. This was specifically in reference to the accepted symbols.

For the time being, Mr. Jim Truex recommended that we not attempt to provide a definition for "software-based device".

We discussed the possibility of combining this change with the first agenda item, which had been attempted in previous years. Alternatively, if the NIST Handbook 44 changes from agenda Item 1 are made, this agenda item could be addressed in NCWM Publication 14.

After further discussion, the wording in G-S.1.d under agenda Item 1 (Software Identification/Markings) was changed. Agenda Item 2 (Identification of Certified Software) will remain; however, it will address potential changes to NCWM Publication 14 and contain no suggested modifications to NIST Handbook 44. (See changes and conclusion under agenda Item 1 for further details.)

The Sector chair volunteered to review the existing slide presentation detailing the purpose of these changes, to ensure that it accurately reflects this information.

2015 Grain Analyzer Sector Report Update:
In the Software Sector's 2014 Meeting Summary, it was noted that the list of acceptable menu text and symbols in Appendix A are intended to assist the laboratories in finding the certification number. See **www.ncwm.net** for a copy of the 2014 Software Sector Meeting Summary. The Software Sector noticed the Sectors had not provided feedback and response to the list when it was circulated for comment and reminded the Sectors to provide their comments on Appendix A, "List of Acceptable Menu Text and Symbols." The Software Sector provided examples of where this information can be included in the various checklists, for example, the Weighing Device NCWM Publication 14, page DES-22, Section 3; the Belt-Conveyor Scales, page BCS-10, Section 8.7; the Measuring Devices, page LMD-21, Section 1.6; the Grain Moisture Meter, page GMM-14, Section 1 (G.S.1); and Near Infrared Grain Analyzers, page NIR-8, Section 1 (G.S.1).

Included below is the "List of Acceptable Menu items from Appendix A of the 2014 Software Sector Report. The Software Sector suggested that the list be included in Section 1 General, code reference: G.S.1. Identification for both the GMM and NIR checklist. The GA Sector should review the proposed changes to be added to Section 1 General, code reference G.S.1. of both the GMM and NIR checklist and provide comments and feedback.

National Type Evaluation Program
Grain Moisture Meters – Checklists

Introduction

The checklist is designed so that the user can determine and record the conformance of the device with the elements of the checklist in a logical sequence. It is suggested that the user copy the checklist to serve as worksheets, and thus, preserve the original for reference. Unless specifically requested to do so, the applicant is not required to submit a completed checklist to the National Type Evaluation Program (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.

1. General

Code Reference: G-S.1. Identification

Virtually all measuring equipment (except separate parts necessary to the measurement process but not having any metrological effect) must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. Additionally, devices that have (or will have) an NTEP Certificate of Conformance (CC) Number, must be marked with the CC number or a corresponding CC addendum number "Permanent" markings addresses two aspects: (1) the printed information will withstand wear and cleaning, and (2) if the markings are on a plate or badge, then the marking badge must be "permanently" attached to the device. A permanently attached badge means that the identification information required by G-S.1. is not easily removed, and if removed, then it must be obvious that the badge or plate containing this information has been removed. All markings must be clear and easily readable. The following test procedure shall be used to determine the permanence of the identification markings.

Permanence of Lettering

The lettering for the markings is subject to the following tests to simulate accelerated wear. The markings are then compared with a typical set of labels exhibiting various degrees of wear, graded from minimal effect (1) to excessive unacceptable wear (7).

Attempts are made to remove the marked information, whether on a badge (plate) or on the device itself, using the following means:

1. Rub over one letter of the marking at least 20 times using an ink eraser in the same manner and force as one would normally exert while erasing an inscription written with a ball point pen.

2. Clean the marking or badge with the following cleaners presumed to be "readily available."

   a. Disinfecting cleaning liquid and a damp cloth.

   b. "Soft" household cleaning powder and a damp cloth.

   c. Window cleaning fluids and a damp cloth.

Permanence of Attachment Badge is an attempt to remove the badge by pulling it off or prying off a metal badge that is attached using only adhesive; removal must be "difficult" at all temperatures. If the badge can be removed, it must show obvious evidence that the badge was removed. Acceptable indications are destruction of the badge by tearing, permanent and extensive wrinkling, or repeated exposure of the word "VOID" upon removal of the badge.

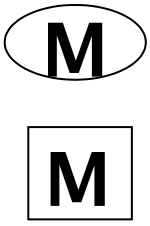
As a practical matter, remote moisture displays are not required to have serial numbers because they typically only repeat the moisture information received from the measuring element. Similarly, external printers are not required to have serial numbers because they do not alter the information received from the measuring element.

If the required information is located on the back of a device, the same information must also appear on the side, front, or top. The bottom of a device is not an acceptable surface for these markings.

The identification marking must be permanent and attached with pop rivets, adhesive, or other permanent means. Removable bolts or screws are not permitted. A foil badge may be used provided that it is durable, difficult to remove, and exhibits obvious evidence of an attempt to remove the marking or badge.

Acceptable menu text and symbols that may be used to assist NTEP laboratories in locating the certification number are included in the "List of Acceptable Menu Test and Symbols" in the table below:

List of Acceptable Menu Test and Symbols

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

(b) Software Protection/Security

Source:
NTETC Software Sector

Background:
The Sector agreed that NIST Handbook 44 already addresses audit trails and physical seals, but these may need to be enhanced.

From the WELMEC Document:

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 consideration of:

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, for example, a dialogue statement or window asking for confirmation of deletion.
- For fault detection see also Extension I.

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

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

The Maryland laboratory had particular questions regarding 3.1 and 5.1. The information for 3.1 could be acquired from an operator's manual, a training video, or in-person training. The items in 5.1 were confusing to the evaluators. The terminology is familiar to software developers, but not necessarily others. It was indicated that manufacturers were typically quick to return the filled out questionnaire, but he didn't know how his laboratory was supposed to

verify that it was true. Generally, the laboratories wouldn't be expected to verify things to that level. For example, if the manufacturer states that a checksum is used to ensure integrity, the laboratories wouldn't be expected to evaluate the algorithm used.

The intent was to see whether the manufacturer had at least considered these issues, not for evaluators to become software engineers. Perhaps a glossary or descriptive paragraphs might be added to assist the evaluators for if the manufacturer has questions for the evaluators.

OIML makes use of supplementary documents to explain the checklist they use. Below are links:
http://www.oiml.org/publications/D/D031-e08.pdf
http://www.welmec.org/latest/guides/72.html
http://www.welmec.org/fileadmin/user_files/publications/2-3.pdf

WELMEC document 2.3 is the original source for our checklist, but it's been significantly revised and simplified. Mr. Payne, Maryland Department of Agriculture, is going to review the other documents and come up with some suggestions for the checklist. Mr. Roach, California Division of Measurement Standards, is going to begin using the checklist. The international viewpoint is that any device running an operating system is considered to be Type U. Mr. Roach mentioned that they're having lots of problems with "skimmers" stealing PINs. Is there some way they can detect this?

Mr. Lewis, Rice Lake Weighing Systems, Inc., mentioned he liked Measurement Canada's website. When answering similar questions, different pages would appear, based on answers to those questions: **http://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00573.html**

At the 2011 NTETC Software Sector Meeting, the laboratories were polled to obtain any feedback on the use of the checklist. Maryland attempted to use this checklist a few times. They had some difficulty obtaining answers from the manufacturers because the individual(s) interacting with the Maryland evaluator didn't always have the required information on hand. More experience in using the checklist will help determine what needs to be revised.

It was suggested that the checklist could be sent to manufacturers for their feedback as well, with the stipulation that it's a completely voluntary exercise and purely informational at this point. The laboratories will coordinate with willing manufacturers to obtain feedback.

Work is ongoing on this item with the intent that it eventually will be incorporated as a checklist in NCWM Publication 14; again the laboratories are requested to try utilizing this checklist for any evaluations on software-based electronic devices.

The checklist has been reviewed with an eye to making its terminology clearer to laboratories. Some examples and clarifications have been added as shown in the discussion section of this item. The revised checklist will be distributed to the laboratories for additional review. Maryland and California laboratories agreed to use the checklist on a trial basis.

At the 2013 Software Sector meeting, it was reported by the NTEP laboratories that attempts to use the current checklist did not meet with many difficulties. The checklists were given to the manufacturers to fill out and that seemed to work rather well. Minor modicifactions were made to clarify confusing areas or eliminate redundancy

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

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

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

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

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

Due to proprietary issues, the laboratories can not give direct feedback from the companies they interact with. Mr. Darrell Flocken volunteered to obtain information from the labortories, aggregate it, and remove any potential proprietary information issues.

The following software checklist was updated during the 2014 Software Sector Meeting:

1. Devices with Software

1.1.	Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **The manufacturer should indicate whether it's solely software or includes hardware in the system. Can the software be changed after the system has been shipped without breaking a seal? AND**	☐ Yes ☐ No ☐ N/A
1.2.	Cannot be modified or uploaded by any means after securing/verification. **With the seal intact, can you change the software?**	☐ Yes ☐ No ☐ N/A
	Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.	
1.3.	The software documentation contains:	
1.3.1.	Description of all functions, designating those that are considered metrologically significant.	☐ Yes ☐ No ☐ N/A
1.3.2.	Description of the securing means (evidence of an intervention).	☐ Yes ☐ No ☐ N/A
1.3.3.	Software Identification, including version/revision. **It may also include things like name, part number, CRC, etc.**	☐ Yes ☐ No ☐ N/A
1.3.4.	Description how to check the actual software identification.	☐ Yes ☐ No ☐ N/A

2. Programmable or Loadable Metrologically Significant Software

2.1. The metrologically significant software is:

2.1.1. Documented with all relevant (see below for list of documents) information. *The list of docs referred to exists in agenda item 5.* ☐ Yes ☐ No ☐ N/A

2.1.2. Protected against accidental or intentional changes. ☐ Yes ☐ No ☐ N/A

2.2. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, Cyclical Redundancy Check (CRC), audit trail, etc. means of security). ☐ Yes ☐ No ☐ N/A

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

3.3. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions. ☐ Yes ☐ No ☐ N/A

3.4. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. ☐ Yes ☐ No ☐ N/A

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

4.5. Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters). **<u>This is a declaration or explanation by the manufacturer.</u>** ☐ Yes ☐ No ☐ N/A

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

5. Software Interface(s)

5.7. Verify the manufacturer has documented:

5.7.1. **<u>If software separation is employed, t</u>**he program modules of the metrologically significant software are defined and separated. ☐ Yes ☐ No ☐ N/A

5.7.2. **<u>For software that can access the operating system or if the program is accessible to the user, t</u>**he protective software interface itself is part of the metrologically significant software. ☐ Yes ☐ No ☐ N/A

5.7.3. The functions of the metrologically significant software that can be accessed ~~**via the protective software interface**~~. ☐ Yes ☐ No ☐ N/A

5.7.4. The **<u>metrologically significant</u>** parameters that may be exchanged ~~**via the protective software interface**~~ are defined. ☐ Yes ☐ No ☐ N/A

5.7.5. The description of the functions and parameters are conclusive and complete. ☐ Yes ☐ No ☐ N/A

5.7.6. There are software interface instructions for the third party (external) application programmer. ☐ Yes ☐ No ☐ N/A

2015 Grain Analyzer Sector Report Update:
It was noted in the 2015 Software Sector agenda that the software Sector checklist that was revised in 2014 will be forwarded to the NTEP laboratories for use on a trial basis. Please provide any comment you may have concerning the proposed revisions to the software checklist above.

(c) Software Maintenance and Reconfiguration

Source:
NTETC Software Sector

Background:
After the software is completed, what do the manufacturers use to secure their software? The following items were reviewed by the Sector. *Note that agenda Item 3 also contains information on Verified and Traced updates and Software Log.*

1. Verify that the update process is documented. (OK)

2. For traced updates, installed Software is authenticated and checked for integrity.

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

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

   Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met.

   The Sector asked, "What sealing requirements are we talking about?"

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

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

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

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

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

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

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

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

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

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

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

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

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

In 2012, the Sector recommended that as a first step, the following be added to *NCWM Publication 14*:

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

Mr. Truex, NTEP Administrator, indicated his opinion that the above sentence is unnecessary since it's self-evident. It was agreed by the group however to ask the other Sectors for feedback on the value of this addition.

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

The Software Sector had no information indicating that the other Sectors had yet been approached for feedback on the value of the addition of the proposed sentence.

The Software Sector would like the other Sectors to evaluate the above proposed change to NCWM Publication 14 and would also like to include some description indicating that an existing audit trail should be protected during a software update.

At the August 2013 Grain Analyzer Sector meeting, Mr. Truex provided a review of the Software Sector's proposals for changes to NCWM Publication 14, Identification of Certified Software, Software Protection/Security, and Software Maintenance and Reconfiguration. Manufacturers had a number of question to include "What is the baseline for which software is considered metrologically significant?" After some discussion the manufacturers requested that they be given additional time to review the proposed changes and to allow their software designers an opportunity to look at the proposed changes to software. Ms. Brenner sent an e-mail on August 29, 2013. to all NTEP grain analyzer manufacturers requesting that comments be submitted to Ms. Lee by October 15, 2013.

The Grain Analyzer Sector manufacturers provided the following comments to the Software Sector's proposal for changes to NCWM Publication 14:

Grain Analyzer Manufacturer's Comments to Software Sector's Proposed Changes to NCWMPublication 14			
Manufacturer	**GA Sector Item**	**Comment**	**Proposed change**
Dickey-john	12a	We currently don't separate the metrologically significant code or identify it's version in the application. We can do this, but it will require a significant code change and validation. Question 1: Does the metrological significant code need to be actually separate from the application or is a label in the application identifying the version of the prediction module used acceptable. This will result in less changes to the code. Question 2: What if we had added a test on the prediction module that inserted key values into the engine, that we would document in the metrological specific tests, that would give a specific answer? For example, if the prediction module is the same then the same inputs with the same calibration file will yield the same results from version to version; log those results and include in the metrological report.	Object to 12.a – The document insists that we separate the legally relevant code and make separate binaries. We could simply add a label that is bound to the prediction module code. Adding this label could tie the prediction module to the version, and will allow us to separately maintain revision control of that code. However, the code itself will not be a separate binary.
FOSS	General	Since FOSS distributes instruments worldwide, having NTEP and OIML requirements the same would be beneficial. I know efforts are being made to have the two as similar as possible. A concern is the potential that software code that is adopted would invalidate the currently approved instruments. A preferred outcome would be that once software code is adopted, only instruments seeking approval (not currently approved) would be required to meet the code.	

In addition, manufacturers that attended the August 2013 Grain Analyzer Meeting, expressed an interest in attending the next 2014 Software Sector meeting to provide additional input.

It was noted in the 2014 S&T Annual Report that Developing Item 310-1 G-S.1. Identification was not considered at the 2013 GA Sector meeting. The Sector considered this item at previous Sector meetings, but it was noted that the Software Sector was still developing this item and that the Sector would provide additional feedback following further development. At the 2013 GA Sector meeting, the Sector was asked to provide comments to proposed changes to NCWM Publication 14.

At the August 2014 Grain Analyzer Sector meeting, manufacturers discussed the Software Sector's proposal for changes to NCWM Publication 14 for identification of certified software, Software Protection/Security, and Software

Maintenance and Reconfiguration. One manufacturer noted the difficulty in separating metrological and non-metrological software. It was noted that if the software is not separated then all software would be considered metrological. The Grain Analyzer Sector had additional questions and made additional comments to the proposed changes to NCWM Publication 14 for identification of certified software, software protection/security, and software maintenance and reconfiguration:

- If the software is not separated, would a manufacturer be required to resubmit the device to NTEP each year for reevaluation?
- Will the requirements for software affect devices that are currently designed and manufactured?
- There are issues with software changes if devices that are already manufactured are required to meet the software requirements.
- It is difficult to redesign devices.

The Grain Analyzer Sector was informed that the Software Sector meeting would be held August 27 - 28, 2014. Manufacturers expressed that they needed the requirements so that these requirements can be considered in future device designs.

At the 2014 joint meetings of the Software, Weighing and Measuring Sectors, the proposed changes to G-S.9. were made to reflect some of the concerns heard from some Sectors and interested parties:

G-S.9. Metrologically Significant Software Updates – A software update that changes the metrologically significant software shall be considered a sealable event.

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

2015 Grain Analyzer Sector Report Update:
The GA Sector should review the changes to G-S.9. and provide any comments or suggested changes.

10. Update on Proficiency Testing

Source:
Dr. Hurburgh, Iowa State University

Purpose:
Develop an air-oven proficiency testing program to ensure state laboratory and manufacturer's air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item Under Consideration:
Update on progress of the ongoing air-oven proficiency testing program for states maintaining a grain moisture laboratory and GMM manufacturers.

Background/Discussion:
At the 2009 NTETC Grain Analyzer Sector Meeting, Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an *ad hoc* basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.

At the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain

moisture laboratory. AOCS would administer the program, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison.

At the Sector's August 2012 meeting, the Sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for states and interested manufacturers, formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The Sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the Sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

The Sector agreed upon the following Program Details:

Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2

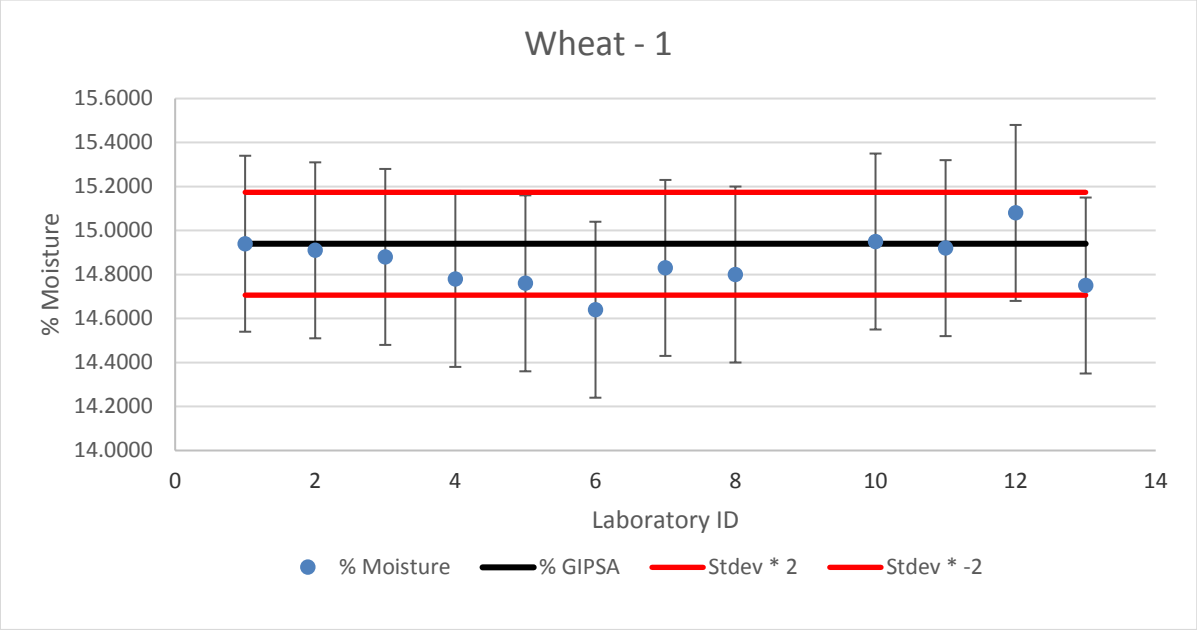
- Cost to Participants - $100.00/year
- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

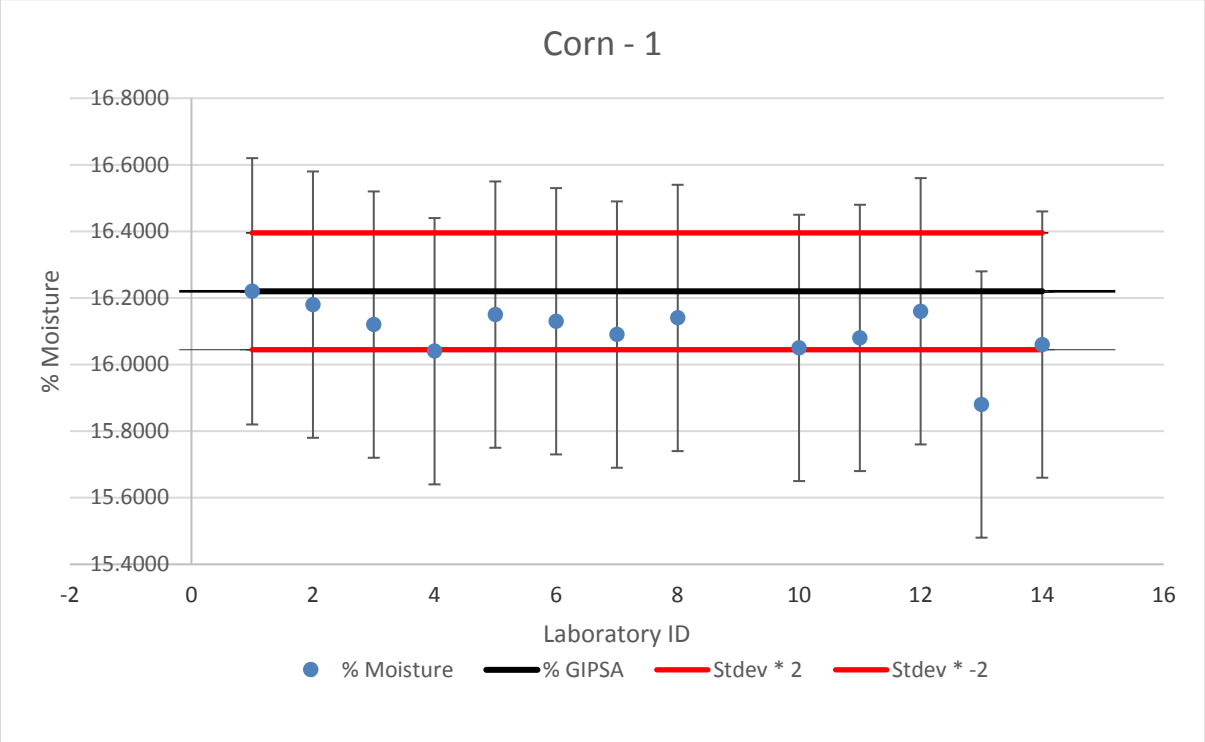
At the August 2013 Grain Analyzer Sector meeting, no report was provided on AOAC's efforts to conduct proficiency testing for grain moisture. Mr. Karl Cunningham, Illinois, and Mr. Kevin Hanson, Missouri, agreed to work together to conduct a grain moisture proficiency test. Mr. Cunningham agreed to provide the samples for proficiency testing and Mr. Hanson, agreed to analyze the data in accordance with the procedures used to conduct proficiency testing in the state laboratory program. Mr. Hanson also agreed to collect data on test weight per bushel which may be useful in field test procedures for evaluating test weight per bushel on instruments. Following the August 2013 Sector Meeting, arrangements were made for shipping grain samples to State participants.

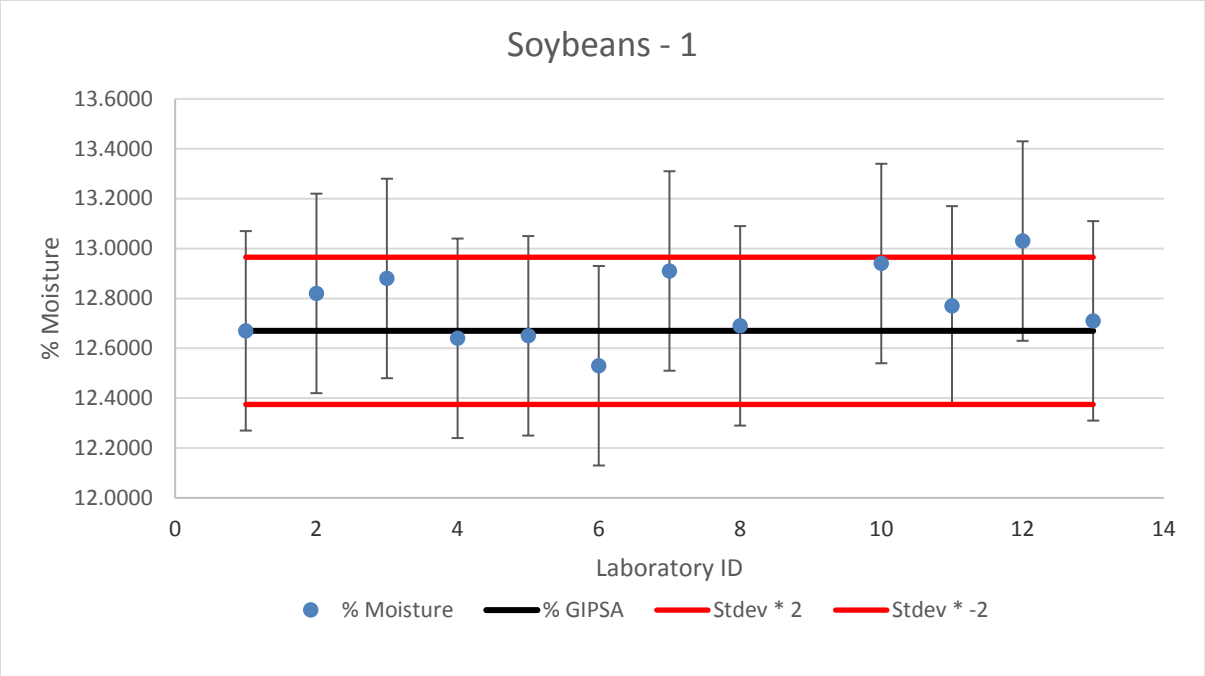
At the August 2014 Grain Analyzer Sector meeting, Mr. Karl Cunningham provide a update on the status of proficiency testing. Mr. Cunningham informed the Grain Analyzer Sector that he collected some wheat grain samples that can be used for grain moisture proficiency testing and that corn and soybeans will be collected during the 2014 harvest. Mr. Cunningham noted that after January 2015 wheat, corn,and soybeans grain samples may be ready for distribution to the participating States. Mr. Cunningham agreed to analyze the data in cooperation with NIST and requested a list of contact information for participating States and other interested parties.

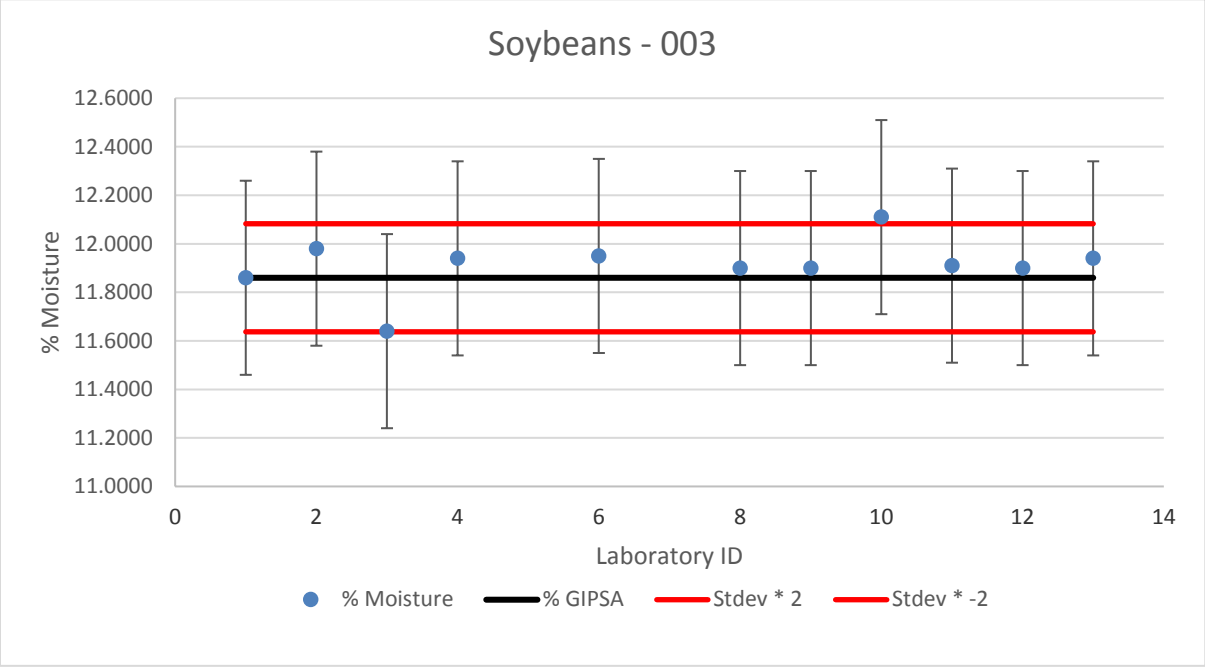
2015 Grain Analyzer Sector Report Update:
NTEP, state, and industry laboratories completed moisture measurement proficiency testing in 2015. Mr. Cunningham collected the data from the participating laboratories. The participants were the NTEP laboratory, USDA GIPSA, which is the laboratory that provided the reference moisture measurements; state laboratories, Arkansas, Colorado, Illinois, Iowa, Maryland, Mississippi, North Carolina, South Carolina, Wisconsin, and Wyoming; and industry laboratories, Dickey-john and Perten. One wheat sample, one corn sample, and two soybeans samples were tested. Ms. Diane lee developed graphs to analyze the data from the participating laboratories. The graphs below show the laboratory moisture measurement results. Only the NTEP laboratory results are indentified in the graphs. With the exception of laboratory number 10 for Soybeans-003, Laboratory 12 for Soybeans-1, and Laboratory number 13 for Corn-1, the laboratories were within two standard deviations of the reference laboratory (GIPSA),

which shows good agreement for most of the laboratory results. Although the laboratories did not report their measurement uncertainties, an average of some previously reported national and state laboratory uncertainties of ± 0.4 % were added to the graphs for further analysis. Although some laboratory moisture measurements were slightly outside two standard deviations from USDA, GIPSA's reference moisture measurement result, if their measurement uncertainty is approximately 0.4 %, the measurement uncertainty overlaps the reference value. The laboratory measurement uncertainties are different for each laboratory and must be reported so that separate evaluations can be made for each laboratory. Uncertanties are also needed for measurement traceability.









11. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments in order to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann provided an update on the Grain Inspection Advisory Committee's Resolutions. The Sector discussed the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibrations annually and ensures equivalency among the different moisture meter models. The Advisory Committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituent instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat.

Unlike moisture [meters] where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition it was noted that there also has to be a mechanism to get manufacturers' calibration data for calibration review.

The Sector will continue to discuss the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices?

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

2015 Grain Analyzer Sector Report Update:
USDA, GIPSA repesentatives mentioned that they are not aware of a discussion paper from Dr. Funk concerning the feasibility of a Phase II program for Near Infrared Grain Analyzers. The Sector should continue to provide feedback on the four bullet items listed above and USDA, GIPSA should provide any updates on any internal discussions.

12. Next Sector Meeting

The Software Sector met jointly with the Weighing Sector and the Measuring Sector in 2015 and are requesting the opportunity to meet jointly in 2016 with the GA Sector. The Software Sector is proposing a half day or one day

meeting at the Chase Suites by Woodfin at KCI in Kansas City, Missouri. The tentative dates for the joint Sector meeting are September 13 - 14, 2016. Sector memebers are asked to hold these days open pending confirmation of availability of facility, determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2016.

If you would like to submit an agenda item for the 2016 meeting, please contact any of the following persons by June 1, 2016:

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

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Appendix D

National Type Evaluation Program (NTEP)
Measuring Sector Meeting Summary

Annual Meeting
September 15-16, 2015
Denver, Colorado

INTRODUCTION

The charge of the NTETC Measuring Sector (herein after referred to as "Sector") is to provide appropriate type evaluation criteria based on specifications, tolerances and technical requirements of NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," Sections 1.10. General Code and all portions of Section 3 including codes for Liquid Measuring Devices, Vehicle Tanks Meters, Liquid Petroleum Gas and Anhydrous Ammonia Measuring Devices, Cryogenic Liquid Measuring Devices, Milk Meters, Water Meters, Mass Flow Meters, and Carbon Dioxide Liquid Measuring Devices. The Sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14, "Technical Policy, Checklists, and Test Procedures" for national type evaluation.

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

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is policy to use metric units of measurement in publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to inch-pound units.

Table A
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Table B
Glossary of Acronyms

CC	Certificate of Conformance	OIML	International Organization of Legal Metrology
DMS	Division of Measurement Standards	OWM	Office of Weights and Measures (NIST)
ECR	Electronic Cash Register	PD	Positive Displacement
HB 44	NIST Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"	Pub 14	NCWM Publication 14
LMD	Liquid Measuring Devices	RMFD	Retail Motor-Fuel Dispenser
mA	milliamp	SI	International System of Units
NCWM	National Conference on Weights and Measures	S&T	Specifications and Tolerances
NIST	National Institute of Standards and Technology	VTM	Vehicle Tank Meter
NTEP	National Type Evaluation Program	W&M	Weights and Measures
NTETC	National Type Evaluation Technical Committee		

This glossary is meant to assist the reader in the identification of acronyms used in this agenda and does not imply that these terms are used solely to identify these organizations or technical topics.

Details of All Items
(In order by Reference Key)

Carry-over Items:

1. Identification of Certified Software

Source:
NTEP Software Sector; *[2014 NCWM S&T Item 310-1 (D)]*

Recommendation:
The Measuring Sector and the Software Sector conducted a joint meeting on September 16, 2015, and were asked to discuss this item that appears as NCWM S&T Item 310-1.

The Measuring Sector was asked to review and provide input on the following proposed changes to G-S.1. Identification that were developed by the Weighing Sector and Software Sector during a joint meeting in August 2014. The Measuring Sector reviewed this item at its 2014 and suggested that it be maintained as an Information item on the S&T Committee's agenda to allow additional time for input. Sector members were asked to be prepared to provide input to the Software Sector at the joint September 2015 meeting.

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(c) a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~**not built for purpose software based software devices**~~ **software;**
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(d) the current software version or revision identifier for not-built-for-purpose software-based devices; **manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2020**;
~~[Nonretroactive as of January 1, 2004]~~
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be:

i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.
(Added 20XX)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2020]
(Added 20XX)

iii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2020]
(Added 20XX)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). ***Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]
(Added 2006)

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

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006 **and 201X**)

Background:
This item originated as an attempt to answer the question "How does the field inspector know that the software running in a software-based weighing or measuring device is the same software evaluated and approved during an NTEP evaluation?"

The Measuring Sector discussed this issue at its 2013 and 2014 meetings and considered several proposals to amend paragraphs "G-S.1. Identification" and "G-S.1.1. Location of Marking Information for Not-Built-for-Purpose, Software-Based Devices." At its 2014 meeting, the Measuring Sector reviewed the proposal shown in the Recommendation above that was developed at a joint August 2014 meeting of the Software and Weighing Sectors. After very thorough discussion of this item, the Sector agreed to forward a recommendation to the SWMA and the NCWM S&T Committees that the proposal to modify G-S.1. remain an Informational item. The Sector agreed with the general direction of the proposal, but believes that additional work is needed before recommending the item for a vote.

See the Sector's 2013 and 2014 meeting summaries for additional details.

At the 2015 Interim Meeting, the S&T Committee agreed to keep the item on its agenda as a Developing item in recognition of the progress that was reported and the planned future joint meeting of the Measuring and Software Sectors. However, because this item has remained on S&T's agenda for several years, the Committee also agreed it would Withdraw the item if a proposal that can be presented for vote is not received before the 2016 NCWM Interim Meeting. At the 2015 NCWM Annual Meeting, testimony heard for this item (which was presented as S&T Agenda Item 310-1) supported continued work on it by the joint Measuring/Software Sector in September 2015. The S&T Committee again emphasized that continued progress on the item is needed to maintain it on the agenda.

Note: A copy of the August 2014 Software Sector Meeting Summary is available from the NCWM website at:

http://www.ncwm.net/resources/dyn/files/1296056z19618afb/_fn/14_Software_Final_Meeting_Summary.pdf

Discussion and Decision: The Measuring Sector deferred discussion of this item to a joint meeting with the Software Sector on the second day of its meeting. The discussion and conclusions for this item are found in the summary of the Software Sector.

2. Software Protection/Security

Source:
NTEP Software Sector

Recommendation: The Measuring Sector was asked to discuss and provide input on the following recommendation (developed during an August 2014 Software Sector and Weighing Sector meeting). The Measuring Sector had considered this recommendation at the 2014 Measuring Sector meeting, but did not reach a consensus on the proposal. At that meeting, the Measuring Sector stated that it believes this item needs additional work and clarity on how it would be applied and asked that this comment be passed onto the Software Sector and the S&T Committee for further review and development.

The Measuring and the Software Sectors conducted a joint meeting on September 16, 2015. The Measuring Sector was given the opportunity to more fully discuss the proposed changes in this joint meeting.

Add the following new paragraph to Section 1.10. General Code of NIST Handbook 44:

G-S.9. Metrologically Significant Software Updates. – ***A software update that changes the metrologically significant software shall be considered a sealable event.***
[Nonretroactive as of January 2, 20XX)

(Added 20XX)

Background:
A draft checklist was proposed for NCWM Publication 14 to evaluate the protection and security of software. At the 2013 Measuring Sector meeting, the proposal was thoroughly discussed and debated. The Sector rejected the proposal; however, manufacturers committed to studying the issue and bringing back alternative(s) to consider at the 2014 Sector Meeting. (See the 2013 NTEP Measuring Sector Meeting Summary for details.)

The Software Sector and the Weighing Sector discussed this item in a joint meeting on August 27, 2014. In September 2014, Mr. Truex forwarded a recommendation from the joint Software Sector/Weighing Sector meeting to add a new section to NIST Handbook 44 as shown in the "Recommendation" above.

At its 2014 meeting, the NTEP Measuring Sector heard many comments on this proposed amendment to add a new paragraph G-S.9. to NIST Handbook 44. Much of the discussion was on the checklist that had been reviewed and rejected by the Measuring Sector at their 2013 meeting. Several Sector members stated they support the proposed amendment. Mr. Keilty stated that he would like to see sealable parameters added to the measuring device portion of NCWM Publication 14 and to recommend the same thing to the other NTEP Sectors. After much discussion and vigorous debate on this proposed new paragraph, there was not agreement on what change constitutes a "metrologically significant change to the software" and what change was simply an update. It was not clear how this proposal would apply to software that does not currently separate metrologically significant and non-metrologically significant portions within itself. The Measuring Sector also discussed that this be added to the list of sealable parameters, but was advised that the Software Sector does not view a software update as a sealable "parameter" or a "feature." The Measuring Sector is amenable to adding this to the table, but recognized concerns about the terminology. (See the Measuring Sector's 2014 meeting summary for additional details.)

An excerpt from the Software Sector's 2014 Meeting Summary, Item 3 Software Protection/Security is included in **Appendix A**; a complete copy of that summary is available from the NCWM website at:

http://www.ncwm.net/resources/dyn/files/1296056z19618afb/_fn/14_Software_Final_Meeting_Summary.pdf

Discussion and Decision:
The Measuring Sector deferred discussion of this item to a joint meeting with the Software Sector on the second day of its meeting, September 16, 2015. The discussion and conclusions for this item are found in the summary of the Software Sector.

3. Software Maintenance and Reconfiguration

Source:
NTEP Software Sector

Recommendation:
The Measuring and the Software Sectors conducted a joint meeting on September 16, 2015. The Measuring Sector was asked to revisit this issue and discuss any alternative proposal(s) from manufacturers to add language into NCWM Publication 14 on how to secure their software. No specific recommendations were provided by Measuring Sector members or the Software Sector prior to this joint meeting.

Background:
The Software Sector posed the following question to the Measuring Sector in 2013, "After the software is completed, what do the manufacturers use to secure their software?" At the 2013 Measuring Sector meeting, proposals were discussed and debated to address this issue. The Sector rejected the proposals; however, manufacturers committed to studying the issue and bringing back alternative(s) to the 2014 Sector meeting. See the 2013 NTEP Measuring Sector meeting summary for additional details.

2014 Software Sector:
Following a joint meeting of the Weighing and Software Sectors in August 2014, the Software Sector discussed the issue of "Software Maintenance and Reconfiguration" and revised the wording of a proposed paragraph G-S.9. to reflect concerns raised by other Sectors and interested parties. (Note that, at its 2014 meeting, the Measuring Sector discussed the proposed new paragraph G-S.9. in conjunction with the agenda item titled "Software Protection/Security." See Agenda Item 2 above for comments and discussion on this proposal.)

The Software Sector proposed the following paragraph be added to the General Code of NIST Handbook 44:

G-S.9. Metrologically Significant Software Updates. – A software update that changes the metrologically significant software shall be considered a sealable event.

At its 2014 meeting, the Software Sector stated it felt that explicitly requiring the metrologically significant software to be given at least the same level of protection as metrologically significant parameters is the best approach. The Software Sector looks forward to feedback from the S&T Committee and other Sectors on this proposed change. The Software Sector still would like to consider the issue of audit trail protection; there is some doubt as to whether the existing language is sufficient as it does not address the integrity of the audit trail during a software update, etc.

2014 Measuring Sector:
At its 2014 meeting, the Measuring Sector was asked to discuss any alternative proposal(s) from manufacturers to add language into NCWM Publication 14 on how to secure their software. The Measuring Sector discussed this item and reviewed Appendix B; *NTEP Measuring Sector 2014 Agenda, Software Maintenance and Reconfiguration, Excerpts from 2013 Measuring Sector Summary*. However, no alternatives were brought forth, nor were there any alternatives provided by the Software Sector. (See the Sector's 2014 Meeting Summary for details.)

An excerpt from the Software Sector's 2014 Meeting Summary, Item 4 Software Maintenance and Reconfiguration is included in **Appendix B**; a complete copy of that summary is available from the NCWM website at:

http://www.ncwm.net/resources/dyn/files/1296056z19618afb/_fn/14_Software_Final_Meeting_Summary.pdf

Discussion and Decision:
The Measuring Sector deferred discussion of this item to a joint meeting with the Software Sector on the second day of its meeting, September 16, 2015. The discussion and conclusions for this item are found in the summary of the Software Sector.

4. Transfer Standards Testing – NIST Handbook 44 Section 3.32. LPG and NH_3 Liquid-Measuring Devices Code and Section 3.37. Mass Flow Meters Code.

Source: Michael Keilty, Endress + Hauser Flowtec AG; *[2014 NCWM S&T Item 332-2 (D)] and [2014 NCWM S&T Item 337-3 (D)]*

Recommendation:
The Sector was asked to provide input on two proposals being developed by Mr. Michael Keilty (Endress + Hauser Flowtec AG). These items appeared on the 2014 NCWM S&T Agenda as Items 332-3 and 337-3 and have been carried over on the S&T Committee's agenda as "Developing" items. These proposals recognize the use of "transfer standards" in field testing of LPG & NH_3 Liquid-Measuring Devices and Mass Flow Meters.

Amend NIST Handbook 44 LPG and Anhydrous Ammonia Liquid-Measuring Devices as follows:

N.3. Test Drafts.

N.3.1. Minimum Test – Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.

Amend NIST Handbook 44 Mass Flow Meters Code as follows:

N.3. Test Drafts.

N.3.1. Minimum Test – Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

Background:
At its 2014 meeting, the Measuring Sector was asked to discuss and comment on two proposals that were submitted to the four regional weights and measures associations in the fall of 2014. These proposals would amend NIST Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Devices and Mass Flow Meters codes, Notes section, Test Drafts, to allow transfer standards (master meters) to test and place devices into service. The Sector thoroughly discussed and vetted this item. There was extensive discussion about the transfer standard (also referred to as a "master meter") itself, such as:

- The need for the master meter to be a superior standard to the meter being examined;
- Verification procedures including the proper reference weighing device's capacity and division size;
- The need to maintain control charts on the master meter;
- Frequency of re-verification for the master meter;
- The need to develop NIST Handbook 105 series specifications, test procedures, and tolerances for "master meters;"
- Development of criteria and the ability of the master meter to assure legal traceability; and
- Training staff in the correct use of master meters in field applications; etc.

The Sector agreed that transfer standards are valuable in verifying measuring systems that are not readily tested with conventional test methods. Examples include measuring systems used to measure products such as CNG, LNG, viscous products, corrosive products, and other products whose physical properties create challenges in testing. The Sector supported moving these proposals forward as "Voting" items.

At the 2015 NCWM Interim and Annual Meetings, the S&T Committee discussed both proposals in the "Recommendation" as a single item. The Committee heard comments from the submitter along with a list of benefits to using a master meter as the standard in testing meters used in applications to measure CNG, LNG, and LPG in comparison to using volumetric or gravimetric standards. The Committee also heard a number of comments, which were reiterated and summarized at its 2015 Annual Meeting regarding additional issues that must be carefully considered.

At the 2015 NCWM Annual Meeting, the Committee noted that with regard to the relative accuracy of a particular test standard, the Fundamental Considerations in NIST Handbook 44 Section 3.2. Tolerances for Standards specify that when a standard is used without correction its combined error and uncertainty must be less than one-third of the applicable tolerance. Some of the other factors include demonstrated reliability of the device over time; device repeatability; how well it duplicates actual use; existence of documentary standards for the test equipment; availability of equipment and facilities within a state laboratory to test the equipment; and whether training has been provided for the laboratory staff, field officials, and users of the equipment. These and other factors were raised by others during the Committee's open hearings.

NIST OWM established a U.S. National Work Group (USNWG) to examine alternative test methods. A subgroup within that USNWG is presently working to establish uncertainties for selected different test methods. OWM has circulated a draft document with guidelines for collecting test data within this subgroup; once finalized, this document might be useful in collecting such data on the use of other types of standards. Currently, there are no representatives

on the subcommittee to review factors that affect the uncertainties of measurements using master meters. However, several members of the larger work group have expressed interest in developing standards and test procedures for master meters in some applications. Should industry want to pursue recognition of master meters, test data may be needed to determine whether this is a viable method and the OWM guidelines might be used for this purpose. Collecting data to assess the test uncertainties associated with using master meters would provide useful information on the potential use of transfer standard meters (master meters) for field testing.

Regarding the specific language in the proposed new paragraph N.3.2. Transfer Standard Test, the Developer may wish to consider eliminating the phrase "test draft" and replacing it with the phrase "delivered quantity" as shown in the alternative version below. This change would be consistent with changes made in 1996 to LMD Code requirements for test drafts to better allow for the use of alternative test methods such as small volume provers.

> **N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the delivered quantity shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.**

Ms. Kristin Macey (California) commented that if the proposal were adopted, it would allow use of a transfer standard and California would not be able to fully support it. She noted that the State of California had completed some comparison testing using the following different test methods: "pressure volume temperature," "gravimetric," and "master meter." Of the three methods compared, the master meter performed worst.

Several regulatory officials and one industry representative commented in support of the continued development of the two items. That industry representative also noted that the NIST Handbook 44 definition of "transfer standard" needs to be expanded.

Mr. Keilty, in response to Mrs. Butcher's and Mr. Oppermann's comments, stated that he agreed completely. Adding the paragraph to these two codes is a step towards allowing the use of transfer standards and it's understood that there's a number of things that would need to be in place in order that they be considered suitable for use in testing. He further noted that a change to the tolerances in these two codes is not being proposed.

The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

See the S&T Committee's 2015 Interim and Final Reports for additional details and regional association comments.

Discussion:
Technical Advisor, Ms. Tina Butcher, introduced the item, noting that it appears on the NCWM S&T Committee's agenda as a Developing Item. The submitter, Mr. Keilty, is looking for additional input to assist in the item's development. Mr. Keilty noted that transfer standards are addressed in some NIST Handbook 44 measuring codes such as the Cryogenic LMD Code, but not in the LPG and NH_3 Code or Mass Flow Meters Code. Providing recognition of this testing method in those two codes would assist manufacturers and jurisdictions who might want to use these types of test methods to facilitate testing. He noted that there has been a significant increase in the interest of using "master meters" as transfer standards for testing devices such as CNG metering systems.

Mr. Randy Moses (Wayne Refueling) noted that procuring appropriate test equipment when type evaluating or field testing CNG metering systems can be challenging. It is difficult to find a scale with an appropriate capacity and division size and the environmental conditions (wind and vibrations) make it difficult to test systems gravimetrically in the field. Additionally, venting of a test tank during CNG testing poses its own problems with regard to safety and environmental issues. The use of master meters is particularly appealing in these applications. Sector members noted that testing of hydrogen metering systems gravimetrically is even more challenging given the extremely light net loads involved.

Mr. Keilty inquired whether or not Measurement Canada has considered the use of master meters. Mr. Luciano Burtini (Measurement Canada) noted that they have the same concerns and the department that addresses CNG metering in

Canada has been approached with similar requests to use master meters. Measurement Canada doesn't typically allow master meters in conventional applications, but they may be allowed in special cases where there are special challenges such as accessibility or high flow rates.

Mrs. Butcher reiterated points made during the 2014 Sector meeting and noted that these same points were raised during NCWM meetings by her and others. She noted that the use of master meters is a topic of great interest to many weights and measures jurisdictions and industry, particularly in applications where the product is caustic or corrosive or poses safety concerns; flow rate is such that conventional proving may not be practical or even available; environmental factors such as wind and vibration make other methods difficult; etc. Mr. Keilty concurred with these comments and acknowledged that there are many provisions that need to be in place to recognize such standards, but he also noted that one of the necessary components is to ensure that NIST Handbook 44 would support these devices once the other provisions have been addressed.

One question raised during the discussion was the origin/purpose of the two-minute minimum specified in the proposed paragraph titled "Transfer Standard Test." Mr. Keilty noted that the two-minute reference mirrors similar language in existing NIST Handbook 44 paragraphs that reference transfer standards and may also mirror an OIML recommendation, but he has no objection to a proposal to modify this value if appropriate. Several Sector members discussed specific procedures used for testing CNG Metering systems and noted that the NIST Examination Procedure Outline specifies specific sizes of test drafts duplicating a fill starting with cylinders filled to one-third, two-thirds, and full capacity.

Mr. Dmitri Karimov (LC) questioned whether there was an intent to limit requirements for CNG metering to the Mass Flow Meters Code, to which Mr. Keilty responded there was no intent to impose such a limitation. Mr. Karimov noted that it seems a bit unbalanced to address this only in select codes and suggested consideration be given as to whether or not similar language would be appropriate for other codes such as the VTM Code.

While resources are extremely limited with OWM's Legal Metrology Devices Program, Mrs. Butcher noted that NIST, OWM hopes to assist jurisdictions in assessing the appropriateness of alternative methods of testing metering systems. Some work is being done through the NIST USNWG on Alternative Test Methods, including the development of guidelines that could be used by a jurisdiction assessing the suitability of a given test method and in ensuring that provisions needed to ensure NIST traceability have been addressed. Mrs. Butcher noted that another aspect of assessing a given test method is to ensure that its combined error and uncertainty are less than one-third of the applicable tolerance (in addition to other provisions outlined in NIST Handbook 44 Appendix A Fundamental Considerations). She also noted that in the Carbon Dioxide Liquid-Measuring Devices Code, a larger tolerance is allowed for tests using a transfer standard. This recognizes that, if the test method is contributing additional error and/or uncertainty to the process, this should not detract from the tolerance permitted for the metering system under test. Thus, another component of assessing the suitability of a given test method is an uncertainty analysis.

The NTEP Laboratories noted that they are often faced with the question of whether or not a test method proposed by a manufacturer for use during type evaluation is appropriate. Mr. Roach stated that there need to be some kind of guidelines for transfer standards and what additional provisions would be required in order to ensure traceability to NIST. Several Sector members expressed interest in working together to identify such guidelines for review by the Sector. Mr. Buttler developed some criteria that might be used as a starting point and offered to work with others who are interested.

Mr. Keilty expressed appreciation to the Sector for the discussion on this issue and the comments shared. He indicated he believes this discussion is a good start to further work to develop this issue and looks forward to working with others who may want to develop proposed guidelines for selecting test methods during NTEP testing.

Decision:
After lengthy discussion on this issue, the Sector did not reach any conclusions on this proposal to share with the submitter or with the S&T Committee. The Sector reiterated points made during its 2014 meeting (see "Background" section earlier in this item.) Additionally, while the Sector does not have specific recommendations regarding the proposal, the following "observations" might be useful for further work on this issue.

- The use of master meters has particular appeal for use in testing devices such as CNG metering systems where factors such as product type, safety, environmental factors, and the availability of equipment pose special challenges.

- Use of gravimetric testing for CNG has been reported to pose challenges such as returning/disposing of product; procuring a suitable scale and test tank; and controlling environmental influences that may affect testing results.

- Field standards must comply with the general criteria in NIST Handbook 44, Appendix A, Fundamental Considerations, including general criteria for field standards.

- Recognition of transfer standards in NIST Handbook 44 does not, by itself, ensure recognition or acceptance of these devices as an acceptable test method.

- Specific types of field standards do not have to be specifically identified in NIST Handbook 44 in order for a weights and measures jurisdiction to recognize their use in testing measuring devices.

- Additional provisions must be in place to ensure traceability of measurements using a transfer standard as an official test method. Examples include documentary standards for the field standard (e.g., NIST Handbook 105 applicable to the standard); training for laboratory metrologists in the testing of the field standard; control procedures to ensure continued performance of the transfer standard; training of field staff in the use of the transfer standard; and control procedures for maintaining the master meter.

- A master meter must perform better than the meter under test.

The Sector noted that the selection of appropriate test methods for type evaluation is an issue that is often faced by NTEP evaluating laboratories. The Sector agreed that guidelines on determining an appropriate test method(s) for an evaluation would be helpful to both the laboratories and manufacturers. Several Sector members including the following expressed an interest in working together to develop such guidelines for inclusion in NCWM Publication 14:

Marc Buttler, Emerson Process Management/Micro Motion
John Roach, CA Division of Measurement Standards
Michael Keilty, Endress + Hauser Flowtec AG, USA
Tina Butcher, NIST OWM

This subgroup agreed to bring any recommendations it develops back to the Sector at its 2016 meeting as a carryover item, either as part of the NIST Handbook 44 item or as a separate item for type evaluation criteria.

New Items:

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

Source:
NCWM S&T Committee

Background:
At its 100th meeting, the National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2016 Edition of NIST Handbook 44. These items were included on the Sector's agenda to inform the Measuring Sector of the NCWM actions and recommend corresponding changes to NCWM Publication 14.

A. Section 3.30. Liquid-Measuring Devices Code, Table S.2.2. Categories of Device and Methods of Sealing

Background:
At the 2015 NCWM Annual Meeting, the "Methods of Sealing" section for Category 3 devices in Table S.2.2. was modified as shown below:

Table S.2.2.
Categories of Device and Methods of Sealing

Categories of Device	***Methods 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.]** *[*Nonretroactive as of January 1, 1996]*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *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.* *[Nonretroactive as of January 1, 2001*	*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* ***<u>on demand</u>*** *through the device or through another on-site device.* ***<u>The information may also be available electronically.</u>*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]
(Table Added 1993) (Amended 1995, 1998, 1999, ~~and~~ 2006**<u>, and 2015</u>**)

On a Category 3 device, the event log must be available through the device or through another device on site. The requirement to make this information available in printed or hard copy form has not changed. However, the language was refined to recognize that some systems may, in addition, be able to provide this information electronically. Some inspectors (or device owners) may find the electronic form to be a convenient way of receiving and viewing the information and, while a printed copy is still required to be made available at a minimum, this change recognizes that some systems may provide both forms.

Recommendation:
As a result of the changes to Table S.2.2., the Sector was asked to recommend the following changes to NCWM Publication 14. In the process of reviewing NCWM Publication 14 to identify necessary changes, several editorial changes to referenced appendices were also identified by the technical advisor.

Page LMD-42, Code Reference S.2.2.:

9. Measuring Elements

Code Reference: S.2.2. Provision for Sealing

Measuring elements shall be designed with adequate provisions to prevent changes from being made to the measuring element or the flow rate control (if the flow rate control affects the accuracy of deliveries) without evidence of the change being made. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.

1.1.	A measuring element shall have provisions for either:	
1.1.1.	Applying a physical security seal. **OR**	☐ Yes ☐ No ☐ N/A
1.1.2.	An approved means of security (e.g., data change audit trail) so that no changes may be made to its adjustable components.	☐ Yes ☐ No ☐ N/A
1.2.	Any adjustable element controlling the delivery rate shall provide for sealing or other approved means of security (e.g., data audit trail) if the flow rate affects the accuracy of deliveries.	☐ Yes ☐ No ☐ N/A
1.3.	When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.	☐ Yes ☐ No ☐ N/A
1.4.	Audit trails shall use the format set forth in the Common and General Code Criteria section of this checklist (Code Reference G-S.8) and in Appendix A, ~~**Audit Trail Checklist for Liquid Measuring Devices**~~**Philosophy for Sealing, and Appendix B, Requirements for Metrological Audit Trails**.	☐ Yes ☐ No ☐ N/A
1.5.	Retail motor fuel dispensers with remote configuration capabilities shall be sealed according to Table S.2.2. in Appendix A, **Philosophy for Sealing, and Appendix B, ~~Minimum~~ Requirements for Metrological Audit Trails ~~for Liquid Measuring Devices~~** and under the "Common and General Code Criteria" section of this checklist.	☐ Yes ☐ No ☐ N/A

Appendix B – Requirements for Metrological Audit Trails, Modify Category 3 requirements as follows:

Category 3.
A device that allows virtually unrestricted access to configuration parameters or calibration parameters, or has remote configuration or calibration capability, must have an event logger as its minimum form of the audit trail. All devices with remote configuration capability manufactured after January 2005 must comply with the sealing requirements of Category 3.

An event logger contains detailed information on the parameters that have been changed and documents the new parameter values. An event logger requires a significant amount of memory;

however, it is anticipated that any device to which unrestricted access is given, will be part of sophisticated measurement process that will have considerable memory available. A centralized audit trail may be used, but additional criteria apply.

Liquid Measuring Devices Code: S.2.2. 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. Any measurement element. OR

b. Any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries. When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

c. Audit trails shall use the format set forth in Table S.2.2.

[Non-retroactive and enforceable as of January 1, 1995.]

(Amended 1991, 1993, ~~and~~ 1995**, and 2015**)

Modify Category 3 of Table S.2.2. Categories of Device and Methods of Sealing in Appendix B as follows:

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 **on demand** through the device or through another on-site device. **The information may also be available electronically.** The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. **Note:** Does not require 1000 changes to be stored for each parameter.

Discussion: The Sector reviewed this item, but there were no comments or discussion.

Decision: The Sector agreed to recommend to the NTEP Committee that the changes outlined in the Recommendation above be incorporated into the next edition of NCWM Publication 14.

B. Appendix D – Definitions; Definition of "Point-of-Sale System."

Background: At the 2015 Annual Meeting, the NCWM adopted the following changes to the definition for "point-of-sale system."

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. **The system components, when operated together must be capable of the following:**

1. determining the weight or measure of a product or service offered;

2. calculating a charge for the product or service based on the weight or measure and an established price/rate structure;

3. determining a total cost that includes all associated charges involved with the transaction; and

4. providing a sales receipt.

(Amended 2015)

There are multiple references to the term "point-of-sale system" in NCWM Publication 14 in both the LMD Checklist and the Retail Motor-Fuel Dispensers Interfaced with Electronic Cash Registers Checklist. However, the definition itself does not appear in these documents and the modifications to the definition outlined above do not appear to impact these checklist references.

Recommendation:
No action was requested of the Sector on this item. This item was included to update Sector members on changes to Handbook 44 and make them aware of changes that might affect how the term "point-of-sale system" is interpreted.

Discussion:
The Sector reviewed this item, but there were no comments or discussion.

Decision:
The Sector agreed to recommend to the NTEP Committee that the changes outlined in the Recommendation above be incorporated into the next edition of NCWM Publication 14.

6. G-S.8.1. Multiple Weighing or Measuring Devices that Share a Common Provision for Sealing, Update to NCWM Publication 14 Liquid-Measuring Devices (LMD) Checklist.

Source:
NTEP Measuring Sector Technical Advisor, Tina Butcher

Background:
Even before the adoption of paragraph G-S.8.1. in 2007, the Liquid-Measuring Devices (LMD) Code included a paragraph "S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing" that required changes to adjustments of any measuring element to be individually identified. When paragraph G-S.8.1. was added to the General Code as nonretroactive paragraph (effective 2010), a note was added to LMD Code paragraph S.2.2.1. indicating that paragraph S.2.2.1. would be deleted in 2010. Although LMD Code paragraph S.2.2.1. was removed from NIST Handbook 44 in 2010, the corresponding references in Publication 14 were not removed.

Recommendation:
The Sector was asked to recommend that NCWM Publication 14 Code Reference S.2.2.1 and its accompanying note be modified as follows. (See NCWM Publication 14 page LMD-42)

Code Reference: ~~S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing~~ G-S.8.1 Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing.

9.6 A change to the adjustment of any measuring element shall be individually identified. ☐ Yes ☐ No ☐ N/A

Note: Examples of acceptable identification of a change to the adjustment of a measuring element include but are not limited to:

a. A broken, missing, or replaced physical seal on an individual measuring element.

b. A change in a calibration factor for each measuring element.

c. Display of the date of or the number of days since the last calibration event for each measuring element.

d. A counter indicating the number of calibration events per measuring element.

~~***Note: S.2.2.1. will be removed in the 2010 edition of NIST Handbook 44 when General Code paragraph G-S.8.1. Multiple Weighing or Measuring Elements with a Single Provision for Sealing becomes effective.***~~

Discussion:
Technical Advisor, Ms. Tina Butcher, noted that this item is proposed to correct an apparent oversight in the LMD checklist in NCWM Publication 14. When paragraph S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing was removed from the NIST Handbook 44 LMD Code in 2010, the corresponding paragraph and note in the LMD checklist should have been deleted. There was limited discussion on this item. Several sector members commented that this is primarily a "housekeeping" item to correct an apparent oversight in the checklist.

Decision:
The Sector agreed to recommend to the NTEP Committee that the changes outlined in the Recommendation above be incorporated into the next edition of NCWM Publication 14.

7. Vehicle-Tank Meters – Corrections to ATC Tolerances in NCWM Publication 14

Source:
CDFA Division of Measurement Standards (DMS), Mr. John Roach and Mr. Dan Reiswig

Recommendation: Modify LMD Checklist Field Evaluation and Permanence Test Section C as follows:

C. Field Evaluation and Permanence Test for Vehicle-Tank <u>Meters</u>- <u>(</u>Except for LPG, Cryogenic and CO2 Meters)

The following tests are considered to be appropriate for vehicle-tank metering systems:

- Four test drafts at each of five flow rates.
- One vapor or air eliminator (product depletion) test.

Note: *The normal test of a measuring system shall be made at the maximum discharge rate that may be anticipated under the conditions of the installation. Any additional tests conducted at flow rates down to and including one-half of the sum of the maximum discharge flow rate and the rated minimum discharge flow rate shall be considered normal tests. (Code reference N.4.1.)*

Only one meter is required for the initial test, and after the test, the meter will be placed into service for the permanence test. The minimum throughput criterion for these meters is the maximum rated flow in units per minute × 2000.

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 (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances.

Tests of Automatic Temperature Compensating Systems (Code Reference T.2.1.)

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.

Background:
In 2010, the NCWM adopted changes to NIST Handbook 44, Section 3.31. Vehicle-Tank Meters Code to revise the tolerances applicable to tests of the automatic temperature compensating system. Changes were not made to corresponding references in the LMD Checklist and NCWM Publication 14 does not reflect the current tolerances specified in NIST Handbook 44. The changes proposed in the "Recommendation" above will align the tolerances in NCWM Publication 14 with those in NIST Handbook 44.

Discussion:
Technical Advisor, Ms. Tina Butcher, noted that this item is proposed by CDFA to correct an apparent oversight in the LMD checklist in NCWM Publication 14. When the tolerances for testing automatic temperature compensation systems on vehicle-tank meters was modified in the NIST Handbook 44 Vehicle-Tank Meters Code (2010 edition), the corresponding tolerance reference in the LMD checklist should have been deleted. There was limited discussion on this item. Several sector members commented that this is primarily a "housekeeping" item to correct an apparent oversight in the checklist.

Decision:
The Sector agreed to recommend to the NTEP Committee that the changes outlined in the Recommendation above be incorporated into the next edition of NCWM Publication 14.

8. NCWM Publication 14, Technical Policy P. Turbine Meters with Both Vertical and Horizontal Orientation.

Source: CDFA Division of Measurement Standards (DMS)

Recommendation: The Sector was asked to consider the following changes to LMD Checklist Technical Policy Section P:

P. Turbine Meters with both Vertical and Horizontal Orientation

In addition to the Common General Code Criteria, Common Specific Code Criteria, and the Field Evaluation and Permanence Tests, the Committee noted that the following applies to tests of turbine meters, which **can** feature both vertical and horizontal orientation, and both directions of flow due to the effect on meter performance.

For NTEP testing, at least one meter must be tested in each direction (vertical and horizontal) of orientation. If the meter may be installed in this manner, it ~~must~~ **may** be tested in both directions and with the meter flow in both directions.

Background: Mr. John Roach (CDFA Division of Measurement Standards) questioned the language in NCWM NTEP Publication, Technical Policy P. Turbine Meters with both Vertical and Horizontal Orientation. He expressed concern that the way it is currently written, these meters are required to be tested in both vertical and horizontal orientations. Mr. Roach proposed the changes outlined in the "Recommendation" above to address these concerns.

Discussion: The Sector discussed ways in which meter orientation and direction of flow have the potential to affect measurement accuracy and performance for turbine meters. Mr. Roach summarized his concerns and the situation which gave rise to his concerns about the current language in NCWM Publication 14, Technical Policy P.

Technical Advisor, Ms. Tina Butcher (NIST, OWM), noted that this paragraph was added to NCWM Publication 14 following discussions at the Sector's January 1989 meeting. At that meeting, the Sector agreed to the following:

> The orientation of the meter in its installation and the direction of product flow can have an effect on meter performance. The effects of gravity can alter the meter's ability to perform properly. The Committee recommends that a turbine meter be tested in both directions (vertical and horizontal) of installation if it may be installed in both directions and with meter flow in both directions if it is used in this manner. It is thought that the positions between the vertical and horizontal will not vary significantly from the results obtained in these two positions.

The Sector discussed aspects of meter installation, noting both meter "orientation" and "direction of product flow" can have an effect on meter performance for some designs of meters. The Sector acknowledged that not all meters are designed to be used in both horizontal and vertical orientations; likewise, not all meters are designed or intended to be used in multiple directions of flow. However, if a meter is intended to be used in more than one orientation and/or in more than one direction of flow, the Sector agreed that performance under those different conditions must be verified through testing during type evaluation. The Sector agreed that the Technical Policy in NCWM Publication 14 needs to be clarified to require testing to verify performance only in the orientation(s) and flow direction(s) intended by the manufacturer and to clarify that meter "orientation" is a separate variable from meter "direction of flow."

Some Sector members felt that limitations of installation with regard to orientation or direction of flow should be marked on the meter and specific, corresponding marking requirements be added to NIST Handbook 44. However, the consensus was that including the information on the CC for the meter was sufficient and would be an effective way to address any limitations that must be addressed in specific installations.

Decision:
The Sector agreed to recommend that the following changes be made to Section P. of the Technical Policy in NCWM Publication 14.

P. Turbine Meters with Both Vertical and Horizontal Orientation.

In addition to the Common General Code Criteria, Common Specific Code Criteria, and the Field Evaluation and Permanence Tests, ~~**the Committee noted that**~~ the following applies to tests of turbine meters~~, **which feature**~~ **designed for use in** both vertical and horizontal orientation**s**~~,~~ and**/or in** both directions of flow due to the effect on meter performance.

For NTEP testing~~, **at least one meter must be tested in each direction (vertical and horizontal) of orientation. If the**~~ **of a** meter **that** may be installed in **multiple orientations (e.g., horizontal, vertical, or other),** ~~**this manner,** it~~ **at least one meter** must be tested in ~~**both directions and with the meter flow in both directions**~~**each orientation. For meters that are designed as "bi-directional," at least one meter must be tested in both directions of flow.**

Limitations in orientation or direction of flow must be addressed as follows:

- **Direction of flow (e.g., bi-directional or uni-directional) must be marked on the meter as well as listed in the Certificate of Conformance.**
- **Limitations regarding the orientation (e.g., horizontal or vertical) must be specified in the Certificate of Conformance; however, these limitations are not required to be marked on the meter.**

- **In the case of a meter approved for use in other than a horizontal orientation, limitations regarding the upward/downward flow must be specified in the Certificate of Conformance; however, these limitations are not required to be marked on the meter.**

9. Expansion of NCWM Publication 14 LMD Technical Policy A, Test Location and CC Information.

Source: NTEP and NTEP Laboratories

Recommendation: Modify LMD Checklist Technical Policy A as follows:

A. Type Evaluation Test Location, ~~and~~ Installations Criteria and Certificate of Conformance Information

The manufacturer has the choice of submitting a meter or liquid measuring device to one of the following for National Type Evaluation Program (NTEP) evaluation:

- A government laboratory
- A field test
- A manufacturer's laboratory

A laboratory test alone may not be sufficient basis on which to issue a Certificate of Conformance (CC.) The policies on product families, meter sizes, and flow rates listed on a CC apply regardless of where the meter is tested. Additional testing may be required based on these policies.

Site Requirements – General

Site requirements for tests to add new sizes to an existing CC:

For tests of a meter size not previously covered on the CC (through testing or through the guidelines outlined for meter sizes paragraph E), the installation selected for test must achieve at least 80 % of the meter's rated maximum flow rate.

Site requirements to add new products to an existing CC:

2. If the size of meter selected for test was previously tested under the CC with another product, then there are no minimum requirements with respect to the flow rates to be achieved in the installation selected for testing.

3. If the size of meter selected for test was covered based on the guidelines outlined for meter sizes not previously tested under the CC with another product, then the installation selected for test must achieve at least 40% of the meter's rated maximum flow rate; otherwise, the site is inappropriate for type evaluation.

To recognize that the maximum discharge flow rate developed by the measuring system will vary with each system, NTEP accepts a maximum discharge rate developed by a system as low as 50 % of the rated maximum flow rate of the device. If the maximum flow rate achieved during and NTEP evaluation is less than 50 % of the maximum flow rate marked on the device, NTEP will limit the maximum flow rate listed on the CC to 200 % of the maximum flow rate achieved during the evaluation.

The CC should include the following information:

- **Approved ranges and parameters (flow rates, viscosity/specific gravity, product family or families, sizes of meter, minimum measured quantity)**
- **Accuracy Class**
- **Application (stationary, vehicle mounted, etc.)**
- **Multi-point calibration (if applicable)**
- **Special restrictions (if applicable)**
- **Operating instructions required to test or inspect the device**
- **Conditions of testing (lab, field, manufacturer facility, etc.), test equipment used and other devices used in the system under test**

Background:
During the spring 2015 NTEP Measuring Laboratories Meeting, NTEP Laboratory representatives reviewed the information needed on an NTEP Certificate of Conformance. NTEP Administration and NTEP evaluators agreed that it would be advisable to change NCWM Publication 14. The group reviewed a similar section in the weighing devices portion of NCWM Publication 14, Technical Policy A & B. The group proposes expanding Technical Policy A. in NCWM Publication 14 to include pertinent information that should be included on NTEP Certificates of Conformance for Liquid Measuring Devices as shown in the "Recommendation" above.

Discussion:
Mr. Truex related the discussions at the 2015 NTEP Laboratories Meeting and noted that the proposed changes are intended to help improve uniformity in CCs and help ensure that key information needed by the field official in verifying compliance of the device is readily available. This information will also help provide guidance to manufacturers regarding the minimum information that needs to be included on a CC. Additional information may be added to the CC at the discretion of the NTEP evaluator to help provide key information needed by field officials in inspecting and testing individual devices in the field.

Decision:
The Sector agreed to recommend that the changes outlined in the "Recommendation" above be made to Section A. of the Technical Policy in NCWM Publication 14.

10. Time-Out on Card-Operated Retail Motor-Fuel Dispensers.

Source:
North Carolina Department of Agriculture and Consumer Services, Allen Katalinic

Recommendation:
The Sector was asked to consider proposing the following paragraph for inclusion in NIST Handbook 44 (and to specify "timeout" limits in NCWM Publication 14). The proposed paragraph would limit the amount of time that a credit or debit card can remain authorized and help to avoid misuse by subsequent customers.

S.X.X. Card-Operated Retail Motor Fuel Devices. – After accepting the card, if the device is not activated or there is no product flow within three minutes the transaction must be completed. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to deactivate the dispenser is programmable, it shall not accept an entry greater than three minutes. The 3-minute timeout shall be a sealable feature.

Background:
North Carolina reports a complaint in which an individual purchased fuel with a credit card and after the first customer drove away, the next vehicle received fuel on the first customer's credit card. While paragraph G-S.2.2. Facilitation of Fraud might be used to address the operation of the dispenser; a more specific requirement is needed to enable NTEP evaluators and inspectors to consistently apply appropriate requirements to the system.

Section 39 of the "Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers" section of the NCWM Publication 14 LMD Checklist requires a dispenser that has been "authorized" with a credit or debit card to "de-authorize" if the dispenser has not been turned on after a period of three minutes. There are also provisions requiring "de-authorization" after the handle has been turned off after a delivery. There is no time limit for de-authorization of the dispenser if the handle remains "on" after authorization with a card or if no product flows after a certain period of time after authorization.

Several references to "time out" limits are found in measuring device codes in NIST Handbook 44. The addition of similar requirements to address the use of credit and debit cards on retail motor-fuel dispensers would help to limit misuse of cards. North Carolina proposes that the Sector consider proposing a paragraph for addition to NIST Handbook 44 and adding more specific requirements to NCWM Publication 14 to address these concerns.

Discussion:
Mr. Katalinic provided an overview of the complaint that prompted the proposal. The Sector discussed the proposal at some length. During the discussion, the Sector debated what terminology is most appropriate to use when referencing the process of authorizing a credit or debit card. For example, should the reference be to the "authorization" or "activation" of the dispenser? Likewise, is the key issue the activation of the dispenser or the authorization of the card.

Mr. Randy Moses (Wayne Fueling Systems) commented that these features are controlled through the point-of-sale (POS) system rather than the card reader in the dispenser. The RMFD sends a signal to the POS and, if there is no information provided within a specified period of time, the POS de-authorizes the sale. Mr. Moses also expressed concern about the maximum limit of three minutes, noting that for some applications such as filling of saddle tanks on large trucks, this limit may interfere with the transaction process.

Mr. Adam Oldham (Gilbarco, Inc.) concurred that the payment terminal in the dispenser is a "dumb" card-reading device similar to what you would see in many retail locations. The United States and Canada don't presently have mandated pre-set minimum time limits for a "time-out" nor the provisions to seal or limit these settings. He expressed concerns about requiring this to be a sealable feature. Mr. Oldham also noted (and others agreed) that, if the time-out feature is programmable, it should not have to be "sealable" if the maximum amount for which it can be programmed is equal to the maximum permissible time limit (e.g., three minutes in the current proposal). One additional question that needs to be addressed is whether or not this proposed requirement would also apply to cash-activated dispensers.

Mr. Truex commented that the underlying issue for this proposal is that if a dispensing system allows a customer's card to be authorized and that authorization is allowed to remain open for an indefinite period of time, this can facilitate fraud. Without a paragraph such as the one proposed, it would be covered under General Code paragraph G-S.2. Facilitation of Fraud. Mr. Truex noted that this may become an emotional issue and subject to considerable debate in the open hearings of the regional weights and measures associations and the NCWM.

After additional debate and proposed modifications to the proposed language, the Sector developed an alternative version of the proposal which members felt was more appropriate with regard to terminology.

Decision:
The Sector supports the submission of a proposal and agreed to recommend the following, modified version of the proposal **when this proposal is presented to the regional associations and national S&T (by North Carolina):**

> **S.X.X. Card-Operated Retail Motor Fuel Devices. – Within three minutes after the card has been accepted and the device has been authorized, if the device is not activated or there is no initial product dispensed, the device must de-authorize. Re-authorization of the device must be performed before any**

product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than three minutes.

11. NIST Handbook 44 Appendix D – Definitions; Remote Configuration Capability.

Source:
2015 NCWM S&T Committee (2012 Grain Sector; 2015 NIST OWM) [2014 S&T Item 360-2 (D)]

Recommendation:
The Sector was asked to provide input on the development of requirements to address devices which are remotely configured using removable digital storage devices. This item is still under development. However, NIST, OWM is seeking preliminary feedback on a proposed addition to the General Code and accompanying requirements in the specific codes which would state that sealing requirements for such devices are as outlined in this new General Code paragraph. The proposed General Code paragraph appears below and is followed by an example (based on the Scales Code) of how this requirement might appear in the specific codes.

Add the following new paragraph to Section 1.10. General Code:

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

Modify the sealing requirements in Section 2.20. Scales Code as follows:

S.1.11. Provision for Sealing.

S.1.11.1 Devices Adjusted Using a Removable Digital Storage Device. – For those devices adjusted using a removable digital storage device, G-S.8.2. applies.

S.1.11.2 All Other Devices. – Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.
[Nonretroactive as of January 1, 1979]

(b) 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.
[Nonretroactive as of January 1, 1990]

(c) Audit trails shall use the format set forth in Table S.1.11.
[Nonretroactive as of January 1, 1995]

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.

(Amended 1989, 1991, and 1993)

Background:
At its 2014 meeting, the Grain Analyzer Sector agreed to forward a proposal to amend the definition of "remote configuration capability" in NIST Handbook 44 to the S&T Committee for consideration. The following changes were proposed:

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**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]

(Added 1993, **Amended 20XX**)

The SMA supported the Grain Analyzer Sector's proposal. However, during subsequent NCWM meetings, the S&T Committee heard opposition to the proposed changes and also heard some suggested alternatives without being able to reach a consensus on proposed changes. Many acknowledged that technology exists to remotely configure some types of weighing and measuring equipment using removable media.

NIST, OWM commented that when the current requirements for sealing (including the criteria for various categories of devices and audit trails) were developed some years ago, no one had considered devices which could be configured in this manner. OWM suggested that it might be more appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media rather than attempt to modify the current sealing requirements, which apply to other types of devices. If new requirements were developed, current sealing requirements could continue to apply to technology which cannot be adjusted using removable media.

At its 2013 meeting, the Weighing Sector asked its members to assist OWM in identifying the various types of removable storage media used in weighing equipment. This item was also discussed at the 2013 and 2014 Measuring Sector meetings, including the question of and whether or not additional guidance might be needed on what is covered by each sealing category. The Measuring Sector concluded that the definitions are adequate as currently written.

Since grain analyzers in the NTEP program are all already required to be sealed using an "event logger," the Grain Analyzer Sector indicated no interest in continuing to develop this item. Based on input from the weights and measures community, OWM anticipates other device types with the capability to be configured with removable media will be (and in some cases, have already been) developed. NIST, OWM believes that further development of this item is required and needs to include other remote configuration technologies that may be used in other weighing and measuring devices. Consequently, OWM requested that the S&T Committee reassign this item to OWM as a "Developing" item and indicated it plans to develop draft language and request input from the various Sectors at their upcoming meetings.

At the 2015 NCWM Annual Meeting, NIST, OWM updated the S&T Committee on its work on this issue and requested feedback on suggested changes to the General Code that NIST OWM has developed. (These drafts are outlined in the "Recommendation" above.)

OWM also noted that it plans to propose corresponding changes to individual, specific codes to specify that sealing requirements for devices configured with removable media are found in the new, proposed General Code paragraph. An example drafted for possible inclusion in the Scales Code appears below. OWM plans to draft language for other specific codes prior to submitting any recommended changes to the S&T Committee under this item.

At that meeting, the S&T Committee also agreed to reassign this item to NIST, OWM for further development.

Additional background information on NCWM S&T Item 360-2 is contained in the S&T Committee's 2014 Interim and Annual Reports.

Discussion:
Ms. Tina Butcher (NIST, OWM) explained that NIST would appreciate receiving feedback on the general direction for addressing devices configured with removable media that is outlined in the Recommendation above. She noted that the proposal is not yet ready to submit for NCWM action; NIST is still in the process of refining the proposal. The key issue is that some designs of devices that can be configured with removable media do not meet the definition of a remotely configurable device, yet the security concerns are similar. In the example of the grain moisture meter, the removable media must remain in place in order for the equipment to operate, but there is no control to ensure or track that the removable media is not replaced with media with different calibration/configuration values. Such devices weren't envisioned when the current criteria and requirements for sealing electronic devices was developed. Changing the definitions and requirements that are currently in place would impact existing equipment. OWM is attempting to find a solution that would be applied only to this category of device (that can be configured with removable media), but have a minimal impact on equipment that complies with the current sealing requirements.

Mr. Dmitri Karimov (LC) questioned how systems that are configured through wireless communication would be addressed and whether they would be addressed with this proposal. Mr. Luciano Burtini (Measurement Canada) also questioned how the configuration of a device by scanning a bar code would be addressed in the current sealing requirements and suggested that this variation needs to be considered. Several Sector members echoed these points, noting that any new criteria should consider wireless types of communication.

Mr. Marc Buttler (Emerson Process Management/Micro Motion) noted that another approach is for a device to be equipped with a physical switch which puts a USB port into and out of the configuration access mode. Thus, the USB port is not always activated with regard to calibration/configuration. A desired method of sealing would be for the switch to be able to be physically sealed or for the device to be equipped with two event counters. Mr. Truex noted that similar scenarios have been observed for shipping scales where shipping rates were downloaded via USB ports.

Mr. Rich Miller (FMC) noted that some of these scenarios are similar to that in which an EPROM is switched out. There should have been a method of protecting from this type of change. Mr. Buttler echoed that such a change is also modifying the software revisions.

Decision:
The Sector did not develop any conclusions or recommendations on this issue, but provided general comments to assist NIST, OWM in the further development of its proposals. The Sector agreed that variations such as those discussed by the Sector need to be considered either in OWM's new proposal or the current sealing requirements and looks forward to reviewing specific proposals when they are ready.

12. Test Methods for Metering Systems Measuring "Natural Gasoline" and Other Products with Special Characteristics.

Source:
Rich Miller (FMC) and NTEP

Recommendation:
The Sector was asked to provide input on several issues related to the measurement "Natural Gasoline." The Sector is asked for input on the following points:

- What is the most appropriate test method(s) for testing metering systems used to measure "natural gasoline" during NTEP testing (and routine field testing)?
- Where should "natural gasoline" fall in the "Family of Products" table?
- Are additional provisions needed in NIST Handbook 44 to help ensure that metering systems used to measure natural gasoline (and other products with characteristics with low boiling points or other special challenges) remains in the liquid state during normal commercial metering?

- Might the Sector develop general guidelines to assist NTEP laboratories (and field officials) in selecting the most appropriate test methods for other products that may not remain in the liquid state in the range of typical ambient temperatures and pressures?

Background:
Mr. Rich Miller (FMC) brought an issue to NTEP's attention regarding the measurement of "natural gasoline." During the field inspection of a metering system measuring "natural gasoline" Mr. Miller raised concerns regarding the most appropriate test method for testing the metering system. Information provided to NTEP regarding the properties of natural gasoline seems to vary, with boiling points ranging from + °F to + 82 °F. For products with such a boiling point so close to common ambient temperatures, a concern is that during routine field testing, temperatures may exceed the boiling point of the product and tend to vaporize in an open neck-type prover.

Products with special characteristics such as this may pose a challenge, not only in selecting the most appropriate test methods, but in identifying the appropriate place to include them in the "Family of Products" table in the NCWM Publication 14 LMD Checklist Technical Policy section. Input is needed from the Sector regarding categorization of the product in the Family of Products Table.

NIST, OWM was asked to provide input regarding recommended test procedures for routine field inspections and also asked to revise EPO 25 Loading Rack meters to recognize testing with small volume provers. NIST, OWM noted that EPO 25 was developed based upon testing with a neck-type prover. The test procedure in EPO 25 includes specific procedures for testing with a neck type prover such as proper drain procedures, reading test errors, and other details; this EPO does not adequately address testing with other types of test methods. Alternate test procedures would need to be developed for testing conducted with other types of test methods such as small volume provers. NIST, OWM has no immediate plans to develop recommended minimum test procedures (in the form of an EPO) for testing with small volume provers; however, NIST, OWM will revise EPO 25 to include a statement clarifying that the test procedures in EPO 25 are for use with neck-type provers.

In addition to considering the appropriate test methods for metering systems for such products, consideration also needs to be given to whether or not additional NIST Handbook 44 requirements may be needed to help ensure that such products remain in the liquid state during commercial metering. For example, LPG measuring systems are required to have special features such as a differential pressure value to help ensure that the product remains in the liquid state during metering. The Sector may wish to provide input on this aspect of metering such products.
Discussion:

Mr. Miller provided a brief summary of the situation, which led to his initial request. He explained that in the scenario he encountered, a company was using natural gasoline to denature alcohol and, though this product is not always metered, it was being metered in this particular instance. Mr. Miller pointed out that this is not a metering issue; rather, it is a procedural issue. That is, the issue relates to the selection of a test method that is appropriate for the metering system and the product being measured. Mr. Miller noted he had contacted several other weights and measures jurisdictions regarding how they address testing of these meters and some, like Minnesota, indicated that they only test these systems (using a neck-type prover) in cooler weather. They don't check these meters in hot weather.

Ms. Butcher questioned how we know for certain that this is not a metering issue, but rather a testing issue – or if the results were a result of both issues. In researching this issue, OWM and others questioned whether or not special provisions need to be included in the metering system to ensure that vaporization doesn't occur during the metering process. For example, in an LPG metering system, a special component is required to maintain the product in a liquid state during the metering process. Mike Keilty (Endress + Hauser Flowtec AG, USA) also questioned whether the metering system might have created some of the problem. Mr. Marc Buttler (Emerson Process Management/Micro Motion), noted that natural gasoline is somewhere between gasoline and LPG in volatility.

Mr. Miller commented that the system requires that a constant back pressure be maintained upstream of the meter. Additionally, a relatively small amount is dispensed in normal deliveries, whereas a much larger quantity was dispensed during testing into an open prover; thus, vaporization during routine use doesn't typically become an issue.

Ms. Butcher noted that finding authoritative information about the product and its characteristics proved difficult when preparing this issue. She commented that OWM would need additional information about the product in order to make specific recommendations about the best test method to be used or for where the product might fall within the Family of Products Table in NCWM Publication 14. However, as mentioned earlier, a note added to EPO 25 clarifying that the procedure is for use with a neck-type prover would be appropriate in the meantime. Additionally, a note could also be added to caution people to select a test method and to test under conditions that would minimize the effect of vaporization during testing. There is already a paragraph in the "Notes" section of most of the NIST Handbook 44 measuring devices codes that requires care be taken to minimize changes in volume of the test liquid due to temperature and evaporation issues. This "Notes" paragraph is already referenced in any of the measuring device EPOs that reference codes where such a paragraph is included.

Decision:
The Sector discussed and vetted this issue at length, but reached no solution or recommendation. The Sector agreed that the scenario sounded like the issue was more a question of selecting the most appropriate test method. If a more specific proposal including a recommendation for where "natural gasoline" would fall in the Family of Products Table is developed, the Sector is willing to readdress the issue at a future meeting. The NTEP laboratories indicated that they would consult with NIST regarding testing methods to be used for meters dispensing natural gasoline should the question arise during type evaluation. The labs and other Sector members agreed that it appears that a closed type of prover seems most appropriate for testing meters dispensing this product or other liquids that don't remain in a liquid state during ambient temperatures and pressures.

Additional Items as Time Allows:

If time permits, the NCWM S&T Committee and/or other groups would appreciate input from the Measuring Sector on the measuring-related issues that are outlined in the remaining agenda items below. A copy of any regional association modifications or positions will be provided to the Sector when these are made available by the regions.

13. Multi-Point Calibration – NIST Handbook 44 LMD Code – Wholesale Meters.

Source:
Minnesota Weights and Measures Division (2014); [2014 NCWM S&T Item 330-4 (D)]

Recommendation:
This item is included on the Sector's agenda to make members aware of the continued development of a proposal to add new paragraphs to NIST Handbook 44, Liquid-Measuring Devices Code and to ask for input from the Sector on those recommended changes which are outlined below:

N.4.5. Verification of Linearization Factors. All enabled linearization factors shall be verified when a device:

(a) is initially being put into commercial use;

(b) has been placed into service and is officially being tested for the first time;

(c) is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;

(d) is being officially tested for the first time after major reconditioning or overhaul; or

(e) at the discretion of the official with statutory authority.

The verification of enabled linearization factors may be done through physical testing or empirical analysis.

UR.4. Maintenance Requirements.

UR.4.1. Use of Adjustments. – Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

Background:
Wholesale metering systems are used to deliver product at many different flow rates. Many of these systems are equipped with features that allow different calibration factors to be programmed at those flow rates. Companies commonly set accuracy goals of ± 0.05 % at normal and "fallback" delivery rates; however, they are often reluctant to spend time entering different calibration factors for the initial ("start-up") and ending ("shut-down") portions of the delivery. Spending time calibrating the metering system at normal and fallback delivery rates to such a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. An additional concern is that an unscrupulous operator could use the error introduced by the start-up and shut-down portions of the delivery (if known) to adjust calibration at the normal delivery rate such that the overall error of a typical delivery is predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shutdown errors have a counter-intuitive effect. Underregistration errors (which are normally in the consumers' favor) in the start-up and shut-down portions of the delivery may actually create shortages in the total delivery if calibration of the normal rate is adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down errors are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to determine the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge. Terminals and refineries want to maximize the accuracy of their liquid measuring devices by optimizing the calibration factors at typical delivery rates.

This proposal is not intended to have any effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do use multiple calibration factors, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no problems with this requirement by making sure that their devices are in tolerance at slow flow start-up and shut-down rates and that errors are not predominantly in one direction.

At its 2014 meeting, the Sector discussed four proposals submitted in relation to this general issue as a group (see the Sector's 2014 Meeting Summary and the S&T Committee's 2014 and 2015 Annual Reports for details).

Mr. Dmitri Karimov (Liquid Controls) provided a presentation developed by a group of individuals who have been working on this issue. Mr. Karimov noted that this presentation will also be given to all regional weights measures meetings. The purpose of the presentation was to explain the reasoning behind the proposal and to attempt to answer any questions or concerns. The primary objective of the proposal is to linearize the meter's error across its operation, in other words, to flatten the typical error curve that is registered in a measuring device.

Significant discussion and vigorous debate ensued. Participants from the NTEP laboratories present at this meeting stated that nothing is changed to the applicable tolerances and this would only result in a great amount of additional testing with minimal improvement in the results. Other members asked questions about the minimum testing recommended for field inspections and Measurement Canada's procedures were discussed. The Sector did not reach consensus on these proposals and no recommendation was presented from the Sector. Some Sector members stated that the existing NIST Handbook 44 Special Test reference in the Notes section of both the LMD and VTM codes currently allow for these additional tests at multiple calibration points to be conducted, thus, there is no need for this proposal. The Sector did not reach consensus on these items and no recommendation was presented from the Sector.

At the 2015 NCWM Annual Meeting, the S&T Committee grouped several agenda items related to this issue (Agenda Items 330-4 and 331-2) and addressed them simultaneously. During the open hearings, there was a recommendation

made by Ms. Julie Quinn (Minnesota), submitter of the two items, to replace the Item Under Consideration in both agenda items with new language. *(See the "Recommendation" above in the Sector's agenda.)*

In providing justification for the recommendation, Ms. Quinn noted that she had conducted a meeting on Sunday, July 19, 2015, with a group that included several meter manufacturers to consider the proposal. It was during this meeting that the group developed proposed paragraphs N.4.5. and UR.4. and decided to recommend they replace the two paragraphs currently proposed. An industry representative, who is also a member of the group that helped develop the proposal voiced support of the changes proposed by Ms. Quinn.

Mr. Ross Andersen (New York, retired), in considering the new proposal recommended by Ms. Quinn, commented that only part (e) of proposed new paragraph N.4.5. Verification of Linearization Factors is needed. Officials must decide which factors are to be tested or what testing is needed.

Ms. Butcher acknowledged the progress made by the group working on the multi-point calibration issue. She indicated additional work is needed with respect to abbreviating the testing that's needed to verify the performance of a meter with multi-point calibration. She also indicated that detailed procedures might be better suited in a NIST EPO, rather than NIST Handbook 44. In a written analysis of the item provided to the Committee, OWM reiterated the following points presented at the 2015 NCWM Interim Meeting:

- OWM acknowledges that to verify the performance of a meter with multi-point calibration completely, separate tests must be performed with each product that will be metered, and at all flow rates and every calibration factor that has been programmed into the system for those products. This makes obvious the need to perform many tests on a single meter in order to take into account the different factors, and combinations thereof, affecting performance.

- OWM questions however, whether it is reasonable to expect that all regulatory jurisdictions be equipped with the resources necessary to perform the extensive amount of testing required by this proposal. OWM believes that some jurisdictions are likely to consider this practice onerous, and consequently, may not be willing or capable of performing the amount of testing prescribed. OWM also questions whether device owners would be receptive to the amount of time a device would need to be taken out of service in order to complete the testing.

- In considering this item, OWM identified a number of issues that indicate additional work would be needed to further develop this proposal. The following issues were identified:

    - Why limit this concept of testing multi-point calibration devices to LMDs and to only those LMDs being used in a wholesale application? Other types of equipment, both wholesale and retail, including scales, vehicle tank meters, etc., have multi-point calibration. Perhaps there should be a General Code requirement that addresses this issue for all types of devices.

    - Did the multi-calibration group consider statistical sampling to reduce the number of tests required when developing this proposal? Might some form of statistical sampling plan be developed that provides an indication of the level (or amount) of testing required in a given population of devices?

    - Might such detailed procedures be better suited for inclusion in a NIST EPO?

    - It is not clear what is meant by "all products' in the proposal. Is this to mean every grade of product? If the intent is to require every grade of every product, this would conflict with current NTEP evaluation policy.

    - If it is the intent of the multi-calibration work group to classify the testing to be performed on a device with multi-point calibration as "Normal" tests opposed to "Special" tests, which is OWM's understanding, then positioning this new paragraph beneath N.4.2. Special Tests and assigning it the designation "N.4.2.5." would be inappropriate.

- The title of the proposed paragraph, "Initial Verification," conflicts with the following words contained in the first sentence of the paragraph: "or after being repaired or replaced."

- What is meant by "repaired" in the first sentence? Did the multi-calibration group consider the definition of "repaired device" in NIST Handbook 44 or the examples of a "repaired device" that were developed by the NCWM Remanufactured Device Task Force in 2000 when using this term?

- How much testing would be required on a return (callback or reexamination) inspection if a device exceeded tolerance on only one of the initial tests (i.e., one product, flow rate, and calibration factor) when all other initial tests of the same meter (using same or different products at different flow rates and calibration factors) proved accurate? No guidance has been provided on how much testing would be needed on a callback or re-inspection visit (i.e., following repair).

- Should the word "and" replace the word "or" in the first sentence? OWM believes the testing described is intended to apply to equipment put into commercial service the first time, equipment that has been adjusted, and to equipment installed to replace another piece of equipment. If that's the case, the word "and" should be used.

The Committee agreed to replace the Item Under Consideration with the changes proposed by Ms. Quinn and looks forward to future refinements of this item by the submitter.

Discussion:
The Sector briefly discussed this issue. There was general support for the work to develop clear guidelines for testing systems with multi-point calibration capability. The Sector acknowledged that several Sector members have participated in the group working to develop these proposals and several spoke to the proposals.

During discussion of this item, Mr. Allen Katalinic (North Carolina NTEP Laboratory) questioned the format of the language in the proposed paragraph N.4.5. Verification of Linearization Factors. He noted that the lead sentence doesn't flow with the last subsection (e) and does not make sense as written. The Sector developed two alternative versions of the language to address this inconsistency. Prior to the end of the Sector meeting, Technical Advisor, Tina Butcher, contacted Ms. Julie Quinn (MN) who has been leading the work on these proposals. Ms. Quinn expressed appreciation to Mr. Katalinic and identified the option which best represents the intent of the group working on this issue.

Decision:
The Sector reviewed the most recent proposal presented by the group working on multi-point calibration issues. The Sector agreed to support the proposal, noting that several Sector members were part of the group that has been developing this issue. The Sector supports proposed paragraph UR.4. Maintenance Requirements as written. The Sector recommends the following version of the proposed paragraph (which proposed modifications to the beginning of each subsection), as confirmed by Ms. Quinn:

N.4.5. Verification of Linearization Factors. – All enabled linearization factors shall be verified:

(a) when a device is initially being put into commercial use;

(b) when a device has been placed into service and is officially being tested for the first time;

(c) when a device is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;

(d) when a device is being officially tested for the first time after major reconditioning or overhaul; or

(e) at the discretion of the official with statutory authority.

The verification of enabled linearization factors may be done through physical testing or empirical analysis.

14. Multi-Point Calibration – NIST Handbook 44 Vehicle-Tank Meters Code.

Source:
Minnesota Weights and Measures Division (2014); *[2014 NCWM S&T Item 331 2 (D)]*

Recommendation:
This item is included on the Sector's agenda to make members aware of the continued development of a proposal to add new paragraphs to NIST Handbook 44, Vehicle-Tank Meters code and to ask for input from the Sector on those recommended changes which are outlined below:

N.4.6. Initial Verification.

A vehicle tank meter shall be tested at all flow rates and with all products for which a calibration factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.

A vehicle tank meter not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.

Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm, and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm, and 100 gpm.

The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.

UR.1.5. Initial Verification Proving Reports.

Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.

Background/Discussion:
Many terminals and refineries want to maximize the accuracy of their liquid-measuring devices by optimizing the calibration factors at typical delivery speeds and some bulk delivery companies are beginning to utilize the capabilities of electronic registers with multiple calibration factors to optimize their accuracy at flow rates that are customarily used. Just like registers on wholesale liquid measuring devices, these meters can be configured for a standard initial "start-up" and ending "shut-down" quantity delivered at a slower speed than is used for the remainder of the delivery. Service agents are expected to calibrate devices as close to zero as possible, but spending time calibrating normal delivery rates to a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. On the other hand, an unscrupulous operator could also use the known error introduced by the start-up and shut-down errors to calibrate the normal delivery rates so that all the errors on typical deliveries work predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shut-down errors have a counter-intuitive effect. Underregistration, which normally operates in the consumers' favor, may actually create shortages in the total delivery if calibration of the normal rate was adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down error are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to calculate the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge.

This proposal has no effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no problems with this requirement by making sure that their devices are in tolerance at the slower start-up and shut-down flow rates and errors are not predominantly one way or the other.

At its 2014 meeting, the Sector discussed four proposals submitted in relation to this general issue as a group. See the Sector's 2014 Meeting Summary and the S&T Committee's 2014 and 2015 Annual Reports for details.

The proposals outlined in this item for inclusion in the Vehicle-Tank Meters Code were discussed in conjunction with the previous agenda item on this year's (2015) Sector Agenda. See that item for additional details and information.

Discussion:
The Sector briefly discussed this issue. There was general support for the work to develop clear guidelines for testing systems with multi-point calibration capability. The Sector acknowledged that several Sector members have participated in the group working to develop these proposals.

Decision:
The Sector reviewed the most recent proposal presented by the group working on multi-point calibration issues. The Sector agreed to support the language as written, noting that several Sector members were part of the group that has been developing this issue.

15. NIST Handbook 44, Section 3.32. LPG and NH_3 Code – Revisions to Address LPG RMFDs.

Source:
California Department of Food and Agriculture (CDFA), Division of Measurement Standards (DMS). *[2014 NCWM S&T Item 332-1 (D)]*

Recommendation:
The Sector was asked to provide input on proposed revisions to align the LPG and NH_3 Codes with respect to requirements for retail motor-fuel dispensing applications. Included in Appendix C for the Sector's review and comment are the most recent revisions proposed to the NCWM S&T Committee. This version includes input from WWMA's fall 2014 meeting; MMA; and NIST OWM along with additional suggestions from MMA and NIST, OWM made following the 2015 NCWM Annual Meeting.

Background:
The purpose of this item is to add Specifications and User Requirements to NIST Handbook 44 Section 3.32. Liquefied Petroleum Gas (LPG) and Anhydrous Liquid-Measuring Devices Code similar to those in Section 3.30. Liquid-Measuring Devices, Section 3.37. Mass flow Meters, and Section 3.39. Hydrogen-Gas Measuring Devices Tentative Code. The NCWM S&T Committee has received multiple comments on this item and has indicated it supports the objective of making changes to align the LPG and the LMD Code with respect to requirements for retail motor-fuel dispensing applications.

The Sector discussed this item at its 2014 meeting. The Sector heard many comments from meeting participants, and some noted there is an ever-increasing number of liquefied petroleum gas (LPG) dispensers being installed that are intended for and used in retail motor fueling applications. Mr. Roach (CDFA DMS) emphasized that this proposed language is needed because devices used to dispense LPG are specifically exempted from NIST Handbook 44, Section 3.30. Liquid-Measuring Devices, in A.2. Exceptions (b), and that Section 3.32. LPG and NH_3 does not have adequate requirements addressing retail motor fueling applications.

The Sector agreed to keep this item on its agenda for its 2015 meeting. The Sector noted that it supports the concept that LPG retail motor fuel dispenser (RMFD) requirements should be the same as those in NIST Handbook 44, Section 3.30. However, the Sector wishes to take time and carefully go through the proposal to make sure that there are no conflicts with other codes and to assure that it applies to RMFD only.

At the 2015 NCWM Annual Meeting, the S&T Committee reviewed another version of the proposal which included comments from the 2014 WWMA meeting, the MMA, and NIST, OWM. The Committee heard additional suggestions from MMA and OWM and indicated its continued support for this item. Following the Annual Meeting, Mr. Dmitri Karimov (Liquid Controls) and Ms. Tina Butcher (NIST, OWM) incorporated those additional changes and plans to submit the proposed revision to the regional associations in fall 2015. The Sector is asked to review and comment on this revised version as outlined in the "Recommendation" above.

See the 2014 and 2015 NCWM S&T Committee's Interim and Annual Reports for additional details.

Discussion:
The Sector reviewed the latest proposed revisions from MMA and NIST which combine the 2014 WWMA proposal; MMA's comments; and NIST OWM's comments. This latest proposal was included as Appendix C in the Sector's agenda. Ms. Butcher and Mr. Karimov noted that this version appears to address the comments and concerns that have been expressed and noted that these changes are needed to align the LMD and LPG and NH_3 codes with regard to requirements for retail motor-fuel applications. They also noted that modifications were made to the zero-set-back interlock requirement to restrict it to stationary retail devices because the paragraph was structured to address "dispensers." Both Ms. Butcher and Mr. Karimov noted that a similar requirement is needed for vehicle-mounted application. They considered proposing that the requirement for zero-set-back interlock in the Vehicle-Tank Meters Code, paragraph S.2.4. be used as an example. However, paragraph S.2.4. in the VTM Code is in need of modifications (particularly with regard to how the time-out feature is to be applied) to clarify its application. Rather than delay the proposed adoption of the much-needed changes proposed in this item, Ms. Butcher and Mr. Karimov believe it would be better to develop a separate proposal for the addition of a new LPG and NH_3 Code paragraph for zero-set-back interlock requirements to be submitted in the 2016 - 2017 NCWM cycle

Decision:
The Sector supports this most recent version of the proposed revisions to the LPG and NH_3 code prepared by MMA and NIST. The Sector noted that the item proposing a "time-out" provision for card-activated RMFDs should be added to the LPG and MFM Codes at a future point when that item is ready for adoption. However, the Sector does not believe it should be added as part of this current proposal so as not to further delay these changes to the LPG and NH_3 Code.

16. Equivalent Units for Natural Gas.

Source:
NCWM S&T Committee; *[2015 NCWM S&T Item 337-1 (I)]*

Recommendation:
The NCWM S&T Committee continues deliberating on proposed changes to NIST Handbook 44 and NIST Handbook 130 to recognize "alternative units" for natural gas. The S&T Committee would value input from the Sector on this issue.

Background:
For the past several years, the NCWM has discussed multiple proposals to define "equivalent units" for compressed and liquefied natural gas (CNG and LNG). The item has been returned to the NCWM Standing Committees the past two years. The Sector was asked to provide thoughts and input on this issue.

The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. More background on the efforts of NIST and NCWM is available in the Reports of the 78th and 79th NCWM in NIST Special Publication 854 and 870 (see pages 322 and 327, respectively). Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG). For medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The submitter has provided a mathematical justification for the specific

quantity (mass) of compressed natural gas in a DLE and DGE which found in the S&T Committee's 2014 Interim Report. Full details on this issue appears in the NCWM S&T and L&R Committee reports from 2014 - 2015.

At the 2015 Interim Meeting, the S&T Committee considered two proposals (summarized as follows):

> **Proposal 1,** titled, *The Volume Equivalent Compromise Proposal*, in essence proposes amendments to NIST Handbook 44, MFM Code and NIST Handbook 130, MOS to: 1) recognize the indication of natural gas fuel sales in values of *either* volume equivalent units *or* mass units; 2) mandate labeling of the equivalent unit conversion factor on the dispenser; and 3) no longer recognize SI mass units in favor of U.S. customary mass units.
>
> **Proposal 2,** titled, *The Mass Compromise Proposal*, in essence proposes: 1) keeping the *new* phase in period where mass indications for all sales of natural gas motor-fuel will be of a specific maximum value and required for all dispensers effective January 1, 2017; 2) continues recognition the *new* supplemental fuel information for value comparison and taxation purposes; and 3) recognizes the existing compressed natural gas motor-fuel application.

Comments in support of Proposal 1 were primarily heard from representatives of the gas industry, manufacturers of natural gas retail motor fuel dispensers, natural gas refueling station owners, fuel marketers, and other industry representatives. Two state weights and measures directors, Mr. Mahesh Albuquerque (Colorado) and Mr. Joe Gomez (New Mexico), also provided comments in support of Proposal 1. The following list includes the primary comments heard in support of Proposal 1 (this list is not all inclusive of every comment, but intended to capture the key points raised):

- Volume equivalent units recognize what's already in the marketplace – acceptance would put all retailers on the same footing.
- The first proposal provides the best chance of having a national standard.
- The proposal was submitted because of LNG; not CNG. There is no MOS specified for LNG. LNG is a fuel that will mostly be used in trucks.
- The feedback we're hearing from our customers is that they want to make value comparisons using gallon equivalent units.
- We can build dispensers that measure in mass. Providing both indications (mass and equivalent gallons) would be very expensive to build. Our customers like gallon equivalents. It would create confusion if you put two values there. These are two different units of measurement; unlike cash/credit pricing.
- It would be considered an unfair trade practice to advertise on the street in one unit of measure and dispense product in another unit of measure. The advertised unit price should match the unit price on the dispenser.
- We want to hear feedback from our customers. They value the comparison of LNG to diesel because it is a quick and easy determination. We talk to our customers. They want to make comparisons by using DGE.
- Universally, our customers want, ask, and purchase gallon equivalent units. We can provide an indication in mass units. Is it worth changing a twenty-year industry MOS to something industry doesn't want? Our equipment measures in mass and indicates in gallon equivalents.
- Support gallon equivalent units for three reasons:

  1) uniformity,

  2) clarity in the marketplace (there have been no complaints…customers want it), and

3) verification for fairness – both will be verified in mass (not BTU).

Comments heard in support of Proposal 2 were predominantly made by weights and measures officials. The following list includes the primary comments heard in support of Proposal 2 (this list also is not all inclusive of every comment, but intended to capture the key points raised):

- We're a standards organization. Equivalent units are not a standard. This is a marketing tool. Allowing equivalent units would provide industry a competitive advantage.
- Equipment is capable of providing mass indications.
- There is a general lack of support for DGE and GGE units among regulators.
- Label equivalent units on the front of the dispenser and measure and indicate in mass.
- Which method would provide the most value comparison to the customer? Many products offered for sale provide supplemental information. Examples given: fertilizer sold by weight provides square footage coverage information; paint sold by gallon provides spread dimensions, etc.
- Need to sell by a quantifiable measurement – mass.
- Proliferation of "equivalent units" is a real concern.
- There are questions concerning the validity of the equivalent values being proposed. Natural gas composition fluctuates, as does the composition of gasoline. How accurate are the numbers? We're not comfortable that the study on BTU by the Energy Department provides accurate enough information. Industry reported specific gravities change by as much as 12 %.
- We stand to face the same mistake made 20 years ago. It was a mistake then and it would be a mistake now.
- There are new fuels coming onboard. The same argument can be made for equivalent units. How do you tell the next group "no?"
- Products need to be sold by a recognizable unit of measure.
- We are a standard organization – the best way to sell is the way it's actually measured.
- Consumers have purchased propane by weight for years and years. They've never asked how much they were receiving in gallon equivalent units.
- We are not the world. There are not liter equivalent units in Canada, Europe, or Japan.
- Consumers learn what the measurement is and then they do the calculations. Consumers will know before they purchase a vehicle what their cost per mile will be.
- On January 1, 2015, a California law added DGE and GGE. It is a very bad law. I urge the Conference not to follow that course. Support the second proposal.

The NCWM S&T Committee had to choose one of these proposals to recommend to the 2015 NCWM Annual Meeting for a Vote. The Committee chose Proposal 1 as shown below to put forward for a Vote at the 2015 NCWM Annual Meeting. See the NCWM S&T Committee's 2015 Interim Report for the specific proposal.

At the 2015 Annual Meeting, this item was again returned to the Committee for further consideration due to a Split Vote. The Sector is asked to provide input and suggestions for the S&T Committee to consider.

Discussion:
Chair Michael Keilty introduced this item and summarized its history. He noted that "Gasoline Equivalent Gallons (GGEs)" were established in 1994. The NCWM has been asked to consider establishing a similar equivalent unit for LNG, the "Diesel Gallon Equivalent (DGE)." The NCWM has reviewed several proposals, but the issue has stalled, with some weights and measures jurisdictions believing that all sales should be based on mass. The NCWM considered a proposal in July 2015 which would allow either mass or equivalent units as the basis for sale; however, that was returned to the S&T Committee as a result of a split vote.

Mr. Randy Moses (Wayne Fueling) noted that a lot of states are now requiring equivalent units and overriding what is currently in the code. He noted that they are unable to get an NTEP Certificate for devices delivering LNG indicating in DGE. (Note that multiple CCs have been issued for LNG dispensers indicating in mass units.) Mr. Moses noted that Wayne Fueling and Gilbarco can switch back to mass right now, but that doesn't seem to be what industry wants. Mr. John Roach (CAFDA) pointed out that a manufacturer could get a California Type Evaluation Program Certificate (CTEP) for LNG devices indicating in equivalent units. For CNG, GGEs are presently permitted.

Mr. Keilty commented that the proposal is not to remove GGE, but rather to add a DGE for compressed gas. He also noted that his understanding is that, if NIST Handbook 44 is changed to permit the DGE, another NTEP evaluation would not be required, though it may be necessary to do some limited testing to demonstrate that the conversion is correct.

There was some additional discussion about how states are approaching this issue. Mr. Jim Truex (NTEP Director) noted that, when industry was not able to get the proposal accepted through the NCWM, they went around weights and measures agencies directly to state legislatures to push for recognition of the "equivalent units." NTEP has issued CCs for a number of LNG dispenser in mass only. He confirmed Mr. Keilty's comments that, should the NCWM recognize additional alternative units, some limited evaluation may be needed. Thus, an application and some evaluation may be needed, but there would only be limited testing.

Mr. Adam Oldham (Gilbarco) commented that without nationally-recognized requirements, there is nothing to keep the factors/conversion values uniform. Mr. Keilty noted that some states have already adopted different numbers than are in the proposal. As a dispenser manufacturer, you would not know how your customer is going to use the dispenser. Mr. Moses commented that, prior to shipping a dispenser, the manufacturer knows the intended unit and the setup of the value could be a sealable feature.

Mr. Marc Buttler (Emerson Process Management, MicroMotion) commented that in light of the current circumstances, there appears to be multiple different units in use. Thus, it will be necessary for inspectors and NTEP evaluators to be able to view the conversion factor values for every device. He also noted that some have debated the need to mark the value of the equivalent unit relate to mass. Some believe this marking is essential. Manufacturers noted that marking can be handled with an "orderable" graphic and someone in the field with expertise to make changes would need to be sure the proper conversion factor is included.

Decision:
The Sector reached no conclusion on this issue nor did it provide any specific recommendations to the NCWM on this issue. The Sector recognized the challenges faced by industry, manufacturers, and regulators in attempting to find a solution to this issue while maintaining integrity of the measurement process.

Additional Item Added at Meeting:

17. Next Sector Meeting

Background:
Several Sector members asked to discuss the location and general timing of the next Sector meeting. The Sector discussed the benefits of holding the meeting in association with a regional weights and measures association, noting that the Sector has met in conjunction with the Southern Weights and Measures Association, and the Western Weights and Measures Association. While there are benefits to holding the meeting in conjunction with these associations and the Sector has appreciated this in the past, this can create a very long week for those attending both meetings. The

NTEP Director reported that a location in a large airport hotel is sometimes costly, but this location proved reasonable. Holding the meeting in conjunction with the WWMA in 2016 was not seen as a viable option because of its location in Hawaii and the difficulty people may have in getting travel approval. Several sector members expressed satisfaction with the Denver location. Additionally, several members requested that the meeting not be scheduled over a weekend.

Decision:
The Sector acknowledged that the decision is ultimately up to the NCWM Board of Directors. The Sector agreed to ask that the NTEP Director to explore the possibility of holding the meeting in Denver, Colorado, in late September or with the SWMA (once the SWMA has selected a date and location) and make a recommendation for one of these options to the BOD.

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Appendix A
Excerpt from 2014 Software Sector Meeting Summary
Software Sector Item 3, Software Protection/Security

3. Software Protection/Security

Source:
NTEP Software Sector

Background:
The Sector agreed that NIST Handbook 44 already has audit trail and physical seal, but these may need to be enhanced.

From the WELMEC Document:

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 consideration of:

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.

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

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

The Maryland Laboratory had particular questions regarding 3.1 and 5.1. The information for 3.1 could be acquired from an operator's manual, a training video, or in-person training. The items in 5.1 were confusing to the evaluators. The terminology is familiar to software developers, but not necessarily others. It was indicated that manufacturers were typically quick to return the filled-out questionnaire, but he didn't know how his laboratory was supposed to verify it was true. Generally, the laboratories wouldn't be expected to verify things to that level. For example, if the manufacturer states that a checksum is used to ensure integrity, the laboratories wouldn't be expected to evaluate the algorithm used.

The intent was to see whether the manufacturer had at least considered these issues, not for evaluators to become software engineers. Perhaps a glossary or descriptive paragraphs might be added to assist the evaluators for if the manufacturer has questions for the evaluators.

OIML makes use of supplementary documents to explain the checklist they use. Below are links:

http://www.oiml.org/publications/D/D031-e08.pdf
http://www.welmec.org/latest/guides/72.html
http://www.welmec.org/fileadmin/user_files/publications/2-3.pdf

WELMEC document 2.3 is the original source for our checklist, but it's been significantly revised and simplified. Mr Payne, Maryland Department of Agriculture, is going to review the other documents and come up with some suggestions for the checklist. Mr. Roach, California Division of Measurement Standards, is going to begin using the checklist. The international viewpoint is that any device running an operating system is considered to be Type U. Mr. Roach mentioned that they're having lots of problems with "skimmers" stealing PINs. Is there some way they can detect this?

Mr. Lewis, Rice Lake Weighing Systems, Inc., mentioned that he liked Measurement Canada's website. When answering similar questions, different pages would appear, based on answers to those questions: **http://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00573.html.**

At the 2011 NTETC Software Sector Meeting, the laboratories were polled to obtain any feedback on the use of the checklist. Maryland attempted to use this checklist a few times. They had some difficulty obtaining answers from the manufacturers because the individual(s) interacting with the Maryland evaluator didn't always have the required information on hand. More experience in using the checklist will help determine what needs to be revised.

It was suggested that the checklist could be sent to manufacturers for their feedback as well, with the stipulation that it a completely voluntary exercise and purely informational at this point. The laboratories will coordinate with willing manufacturers to obtain feedback.

At the 2013 meeting, it was reported by the labs that attempts to use the current checklist did not meet with many difficulties. The checklists were given to the manufacturers to fill out, and that seemed to work rather well. Minor modifications were made to clarify certain confusing areas or eliminate redundancy. (Note the text above includes the updates made in 2013.)

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

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

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

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

The checklist as updated during the 2014 meeting:

2. Devices with Software

2.1.	Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **The manufacturer should indicate whether it's solely software or includes hardware in the system. Can the software be changed after the system has been shipped without breaking a seal? AND**	☐ Yes ☐ No ☐ N/A
2.2.	Cannot be modified or uploaded by any means after securing/verification. **With the seal intact, can you change the software?**	☐ Yes ☐ No ☐ N/A

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

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

3. Programmable or Loadable Metrologically Significant Software

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

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

4.7. 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

4.8. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. ☐ Yes ☐ No ☐ N/A

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

5.9. Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters). **<u>This is a declaration or explanation by the manufacturer.</u>** ☐ Yes ☐ No ☐ N/A

5.10. 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). **<u>This is a declaration or explanation by the manufacturer.</u>** ☐ Yes ☐ No ☐ N/A

6. Software Interface(s)

6.11. Verify the manufacturer has documented:

6.11.1. **<u>If software separation is employed, t</u>**he program modules of the metrologically significant software are defined and separated. ☐ Yes ☐ No ☐ N/A

6.11.2. **<u>For software that can access the operating system or if the program is accessible to the user, t</u>**he protective software interface itself is part of the metrologically significant software. ☐ Yes ☐ No ☐ N/A

6.11.3. The functions of the metrologically significant software that can be accessed ~~**via the protective software interface**~~. ☐ Yes ☐ No ☐ N/A

6.11.4. The **<u>metrologically significant</u>** parameters that may be exchanged ~~**via the protective software interface**~~ are defined. ☐ Yes ☐ No ☐ N/A

6.11.5. The description of the functions and parameters are conclusive and complete. ☐ Yes ☐ No ☐ N/A

6.11.6. There are software interface instructions for the third party (external) application programmer. ☐ Yes ☐ No ☐ N/A

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

The revised checklist will be reviewed and further edited as required, and the updated version can be sent to the labs.

Appendix B

Excerpt from 2014 Software Sector Meeting Summary
Software Sector Item 4, Software Maintenance & Reconfiguration

4. Software Maintenance and Reconfiguration

Source:
NTEP Software Sector

Background:
After the software is completed, what do the manufacturers use to secure their software? The following items were reviewed by the sector. *Note that agenda Item 3 also contains information on Verified and Traced updates and Software Log.*

1. Verify that the update process is documented. (OK)

2. For traced updates, installed Software is authenticated and checked for integrity.

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

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

   Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met.

   The sector asked, "What sealing requirements are we talking about?"

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

   Physical Seal, software log.

   Category III method of sealing can contain both means of security.

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

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

   The manufacturer shall ensure by appropriate technical means (e.g., an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically

significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with U.S. weights and measures requirements.

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

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

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

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

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

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

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

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

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

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

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

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

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

Discussion:
In 2010 the Software Sector had considered the following:

G-S.9. Metrologically Significant Software Updates – The updating of metrologically significant software shall be considered a sealable event.

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

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

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

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

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

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

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

We reviewed the presentation that Mr. Bliss had revised and tweaked it a bit. This sparked more discussion about the difficulty of convincing NIST. There seems to be a fundamental difference in how they understand changes of parameters and/or software. People don't seem to understand the difference between software and data. Adding a slide that explains the difference may help.

Last year's Weighing Sector feedback (Mr. Truex will provide their wording) – they were opposed because:

1. It would change the methods of sealing (category 1, 2, and 3 audit trails) and require a change to NIST Handbook 44.

2. It's not clear that the requirement for authenticity and integrity of the updates is limited to metrologically significant software.

The other Sectors were concerned about this as well.

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

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

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

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

G-S.9. Metrologically Significant Software Updates – A software update that changes the metrologically significant software shall be considered a sealable event.

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

Appendix C

Proposed Revisions to NIST Handbook 44 LPG & NH_3 Code From MMA & NIST OWM – August 2015

The following proposes revisions to align the LPG and NH_3 Codes with respect to requirements for retail motor-fuel dispensing applications. These proposed revisions include input from WWMA's fall 2014 meeting; MMA; and NIST, OWM along with additional suggestions from MMA and NIST, OWM made following the 2015 NCWM Annual Meeting.

S.1.4. For Retail Devices Only.

S.1.4.1 Indication of Delivery. – A retail device shall ~~be constructed to show~~ automatically **show** on its **face the** initial zero condition and the ~~**amounts**~~ **quantity** delivered up to the nominal capacity of the device. **However, the following requirements shall apply:**

For electronic devices manufactured prior to January 1, 2006, the first 0.03 L (or 0.009 gal) of a delivery and its associated total sales price need not be indicated.

For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.
[Nonretroactive as of January 1, 2006]

(Amended 2014)

S.1.5. For Stationary Retail Devices Only.

S.1.5.1. Display of Unit Price and Product Identity. – ~~**In a**~~ A device of the computing type~~**, means**~~ shall ~~be **provided for**~~ display~~ing~~ on each face ~~of the device~~ the unit price at which the device is set to compute or to deliver ~~**as the case may be**~~, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. ~~**If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device**~~.

Except for dispensers used exclusively for fleet sales and other price contract sales, all of the unit prices at which that product is offered for sale shall meet the following conditions:

(1) ***For a system that applies a discount prior to the delivery, all unit prices shall be displayed or shall be capable of being displayed on the dispenser through a deliberate action of the purchaser prior to the delivery of the product. It is not necessary that all of the unit prices be simultaneously displayed prior to the delivery of the product.***

(2) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (1) above, provided the system complies with S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.

Note: When a product is offered at more than one unit price, display of the unit price information may be through the deliberate action of the customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.
[Nonretroactive as of January 1, 201X]

(Added 201X)

~~**S.1.5.3. Recorded Representations, Point-of-Sale Systems. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:**~~

~~**(a) the total volume of the delivery;**~~

~~**(b) the unit price;**~~

~~**(c) the total computed price; and**~~

~~**(d) the product identity by name, symbol, abbreviation, or code number.**~~

~~**(Added 2014)**~~

S.1.5.3. Agreement Between Indications.

(a) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:

(1) *all total values for an individual sale that are indicated or recorded by the system agree, and*

(2) *within each element, the values indicated or recorded meet the formula (quantity × unit price = total sales price) to the closest cent.*

(b) When a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the total volume of the delivery shall be in agreement between all elements in the system.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.4. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity by name, symbol, abbreviation, or code number.

(Added 2016)

S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

(a) the product identity by name, symbol, abbreviation, or code number;

(b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

(c) an itemization of the post-delivery discounts to the unit price; and

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 201X)

S.1.5.6. Transaction Information, Power Loss. 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 device or other onsite device accessible to the customer.
[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.7. Totalizers for Retail Motor-Fuel Dispensers. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through the metering device.
[Nonretroactive as of January 1, 201X]

(Added 201X)

S.2. Design of Measuring Elements.

...

S.2.5. Zero-Set-Back Interlock for Stationary Retail Motor-Fuel Devices – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, 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) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.2.6. ~~S.2.5.~~ Thermometer Well. – For test purposes, means shall be provided to determine the temperature of the liquid either:

(a) in the liquid chamber of the meter; or

(b) in the meter inlet or discharge line and immediately adjacent to the meter.

(Amended 1987)

S.2.7.~~S.2.6.~~ Automatic Temperature Compensation. – A device may be equipped with an adjustable automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F).

S.2.7.1~~S.2.6.1.~~ Provision for Deactivating. – On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters or gallons adjusted to 1 °C (60 °F), provision shall be made to facilitate the deactivation of the automatic temperature-compensating mechanism so that the meter may indicate, and record if it is equipped to record, in terms of the uncompensated volume.

(Amended 1972)

S.2.7.2.~~S.2.6.2.~~ Provision for Sealing. – 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 may be made to the system.

UR.2. Use Requirements.

…

UR.2.7. For Stationary Retail Computing Type Systems Only, Installed After January 1, 201X.

UR.2.7.1. Unit Price and Product Identity.

(a) The following information shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale:

(1) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and

(2) in the case of a computing type device or money-operated type device, the unit price at which the dispenser is set to compute.

Provided that the dispenser complies with S.1.5.1. Display of Unit Price and Product Identity, it is not necessary that all the unit prices be simultaneously displayed or posted.

(b) The following information shall be conspicuously displayed or posted on each side of a retail dispenser used in direct sale:

(1) the identity of the product in descriptive commercial terms; and

(2) the identity of the grade, brand, blend, or mixture that a multi-product dispenser is set to deliver.

(Added 201X)

UR.2.7.2. 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.

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 unit of measure, the total quantity delivered, and the total price of the sale; and

(2) unless a dispenser complies with S.1.5.1. 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.

(c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:

(1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;

(2) all purchases of fuel are accompanied by a receipt recorded by the system for the transaction containing:

a. the product identity by name, symbol, abbreviation, or code number;

b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:

1. total volume of the delivery;

2. unit price; and

3. total computed price of the fuel sale prior to post-delivery discounts being applied.

c. an itemization of the post-delivery discounts to the unit price; and

d. the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 201X)

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Appendix D

2015 Measuring Sector Meeting Summary

National Conference on Weights and Measures/National Type Evaluation Program

Measuring Sector Attendee List Final
September 15-16, 2015/Denver, Colorado

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Appendix E

National Type Evaluation Program (NTEP)
Software Sector Meeting Summary

September 16 - 17, 2015
Denver, Colorado

INTRODUCTION

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

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

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is the policy of the National Institute of Standards and Technology (NIST) to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references U.S. customary units.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

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

Details of All Items
(In order by Reference Key)

WELCOME/INTRODUCTIONS

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

STATUS REPORTS – RELATED NCWM AND INTERNATIONAL ACTIVITY

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

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

JOINT SESSION PROGRESS REPORT, ACTIVE ITEMS OF MUTUAL INTEREST

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

SOFTWARE SECTOR PRESENTATION

Mr. Doug Bliss, Sector Technical Advisor, delivered our State-of-the-Sector Presentation to the joint meeting attendees.

CARRY-OVER ITEMS

1. Software Identification/Markings

Source:
NTEP Software Sector

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

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

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

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

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

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ~~***not-built-for-purpose software-based software devices***~~ ***software****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices~~;~~ **manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2022;**
~~***[Nonretroactive as of January 1, 2004]***~~
(Added 2003) **(Amended 2016)**[1]

(1) The version or revision identifier shall be:

i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

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

(Added 2016)[1]

ii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier. [Nonretroactive as of January 1, 2022]

(Added 2016)[1]

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). ***Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]
(Added 2006) **(Amended 2016)**[1]

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

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006 **and 2016**)[1]

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

ii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an ~~exception~~ alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2022]
(Added 2016)[1]

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

We debated whether to leave the non-retroactive date as 2020. It is possible to use 20XX and explain the intent in

[1] Note the date was corrected editorially. The Added/Amended dates were incorrectly cited as "2017;" however, while these items were added to the 2017 edition of NIST Handbook 44, the dates used are those of the year the Conference took place, which in this case was 2016.

the proposal, but it might be better to leave it as a hard target. Since time has passed since we selected 2020, we backed it off until 2022, anticipating adoption by 2017 (see footnote 1), which would provide the intended period of five years after adoption.

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

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

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

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

2. Identification of Certified Software

Source:
NTEP Software Sector

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

From WELMEC 7.2:

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

From OIML D-31:

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

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

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

- Encryption
- Digital Signature

Is there some method to give the weights and measures inspector information that something has changed?
Yes, the Category III Audit Trail or other means of sealing.

How can the weights and measures inspector identify an NTEP Certified version?
They can't, without adding additional requirements like what is described here, in conjunction with including the identifier on the CC.

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

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

From OIML:

> Separation of software parts – All software modules (programmes, subroutines, objects, etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.
>
> If the separation of the software is not possible or needed, then the software is metrologically significant as a whole.
>
> (Segregation of parameters is currently allowed – see table of sealable parameters)

Identification of Certified Software:

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

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

From NCWM Publication 14:

Identification of Certified Software:

> **Note:** Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data ~~domains~~ form the metrologically significant software part of a measuring instrument (device or sub-assembly).

If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. ~~**The conformity requirement applies to all parts and parts shall be marked according to Section G-S.X.X.**~~

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

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

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

(d) the current software version or revision identifier for ~~***not-built-for-purpose***~~ ***software-based electronic*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.
[Nonretroactive as of January 1, 2007]
(Added 2006)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]
(Added 2006)

(3) The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.
[Nonretroactive as of January 1, 201X]
(Added 20XX)

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

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

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

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

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

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

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

Other questions previously brought up that have not been completely addressed to date are:

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

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

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

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

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

Software Based Device – Any device with metrologically significant software.

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

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

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

3. Software Protection/Security

Source:
NTEP Software Sector

Background / Discussion:
See the 2014 Software Sector Summary for additional background on this item.

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

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

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

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

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

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

The checklist as updated during the 2014 meeting:

1. Devices with Software

1.1. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **The manufacturer should indicate whether it's solely software or includes hardware in the system. Can the software be changed after the system has been shipped without breaking a seal? AND** ☐ Yes ☐ No ☐ N/A

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

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

1.3. The software documentation contains:

1.3.1. Description of all functions, designating those that are considered metrologically significant. ☐ Yes ☐ No ☐ N/A

1.3.2. Description of the securing means (evidence of an intervention). ☐ Yes ☐ No ☐ N/A

1.3.3. Software Identification, including version/revision. **It may also include things like name, part number, CRC, etc.** ☐ Yes ☐ No ☐ N/A

1.3.4. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A

1.4. The software identification is:

1.4.1. Clearly assigned to the metrologically significant software and functions. ☐ Yes ☐ No ☐ N/A

1.4.2. Provided by the device as documented. ☐ Yes ☐ No ☐ N/A

1.4.3. Directly linked to the software itself. **This means that you can't easily change the software without changing the software identifier. For example, the version identifier can't be in a text file that's easily editable, or in a variable that the user can edit.** ☐ Yes ☐ No ☐ N/A

2. Programmable or Loadable Metrologically Significant Software

2.1. The metrologically significant software is:

2.1.1. Documented with all relevant (see below for list of documents) information. *The list of docs referred to exists in agenda item 5.* ☐ Yes ☐ No ☐ N/A

2.1.2. Protected against accidental or intentional changes. ☐ Yes ☐ No ☐ N/A

2.2. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification/inspection (e.g., physical seal, Checksum, Cyclical Redundancy Check (CRC), audit trail, etc. means of security). ☐ Yes ☐ No ☐ N/A

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

3.3. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions. ☐ Yes ☐ No ☐ N/A

3.4. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. ☐ Yes ☐ No ☐ N/A

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

4.5. Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters). **This is a declaration or explanation by the manufacturer.** ☐ Yes ☐ No ☐ N/A

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

5. Software Interface(s)

5.7. Verify the manufacturer has documented:

5.7.1. **If software separation is employed, t**he program modules of the metrologically significant software are defined and separated. ☐ Yes ☐ No ☐ N/A

5.7.2. **For software that can access the operating system or if the program is accessible to the user, t**he protective software interface itself is part of the metrologically significant software. ☐ Yes ☐ No ☐ N/A

5.7.3.	The functions of the metrologically significant software that can be accessed ~~via the protective software interface~~.	☐ Yes	☐ No	☐ N/A
5.7.4.	The **metrologically significant** parameters that may be exchanged ~~via the protective software interface~~ are defined.	☐ Yes	☐ No	☐ N/A
5.7.5.	The description of the functions and parameters are conclusive and complete.	☐ Yes	☐ No	☐ N/A
5.7.6.	There are software interface instructions for the third party (external) application programmer.	☐ Yes	☐ No	☐ N/A

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

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

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

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

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

> ***5.1.1 Software identification***
> *Legally relevant software of a measuring instrument/electronic device/sub-assembly shall be clearly identified with the software version or another token. The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose. The identification shall be inextricably linked to the software itself and shall be presented or printed on command or displayed during operation or at start up for a measuring instrument that can be turned off and on again. If a sub-assembly/an electronic device has neither display nor printer, the identification shall be sent via a communication interface in order to be displayed/printed on another sub-assembly/electronic device.*
>
> *5.1.3.2.a The legally relevant software shall be secured against unauthorized modification, loading, or changes by swapping the memory device. In addition to mechanical sealing, technical means may be necessary to secure measuring instruments having an operating system or an option to load software.*
>
> *5.1.3.2.d Software protection comprises appropriate sealing by mechanical, electronic and/or cryptographic means, making an unauthorized intervention impossible or evident.*
>
> *5.2.6.1 Only versions of legally relevant software that conform to the approved type are allowed for use (see 5.2.5). Applicability of the following requirements depends on the kind of instrument and is to be worked out in the relevant OIML Recommendation. It may differ also depending on the kind of instrument under consideration.*

The question was asked, do these new requirements need to go into a new appendix specific to software in NCWM Publication 14? Do we need to document new requirements at all if the checklist is put into NCWM Publication 14?

It could be considered that the checklist itself constitutes the new requirements. Darrell Flocken and Jim Truex supported that interpretation.

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

4. Software Maintenance and Reconfiguration

Source:
NTEP Software Sector

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

1. Verify that the update process is documented (OK).

2. For traced updates, installed Software is authenticated and checked for integrity.

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

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

Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The other Sectors were concerned about this as well.

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

Reference G-S.8., which is rather loose. NCWM Publication14 goes into much more detail about what is metrologically significant.

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

In 2010 the Software Sector had considered the following:

G-S.9. Metrologically Significant Software Updates. – The updating of metrologically significant software shall be considered a sealable event.

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

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

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

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

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

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

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

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

G-S.9. Metrologically Significant Software Updates – A software update that changes the metrologically significant software shall be considered a sealable event.

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

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

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

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

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

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

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

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

5. NTEP Application for Software and Software-based Devices

Source:
NTEP Software Sector

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

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

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

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

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

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

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

- Engineering specification
- Operating descriptions that characterize the type

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

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

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

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

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

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

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

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

These documentation requirements will be considered as input for requirements that will eventually appear in NCWM Publication 14 and the application paperwork. Further work by the Sector to develop the NCWM Publication 14 requirements is needed, after more input from the labs is gathered. The Sector recommends including the above

bulleted list as an introduction to the checklist as part of our recommendation to include the checklist from agenda Item 3 in NCWM Publication 14. As a description of the accuracy of the measuring algorithms, simply declaring the type and class being aimed for may be sufficient. This list should reflect the needs of the labs for an evaluation. The bulleted list and the paragraph before it should be brought to the labs for an initial review and their input.

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

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

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

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

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

6. Training of Field Inspectors

Source:
NTEP Software Sector

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

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

Items to be addressed:

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

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

1. Identification. The identification (ID) tag may be on the back-room computer server and could be viewed on an identification screen on the computer monitor. The ID information may be displayed on a menu or identification screen. Though currently discouraged, some systems may be designed so the system must be shut down and reset to view the ID information. G-S.1 (1.10.)

    1.1. Manufacturer.

    1.2. Model designation.

2. Provisions for sealing. G-S.8. [1.10]; S.1.11. [2.20]; S.2.2. [3.30]

   2.1 Verify sealing category of device (refer to Certificate of Approval for that system).

   2.2. Verify compliance with certificate.

3. Units of measure.

   3.1. A computer and printer interfaced to a digital indicator shall print all metrological values, intended to be the same, identically. G-S.5.2.2.(a); G-S.5.1. [1.10]

   3.2. The unit of measure, such as lb, kg, oz, gal, qts, liters, or whatever is used, must agree.

4. Operational controls, indications and features (buttons and switches). Verify that application criteria and performance criteria are met (refer to Certificate of Approval).

   4.1. Any indication, operation, function or condition must not be represented in a manner that interferes with the interpretation of the indicated or printed values.

5. Indications and displays.

   5.1. Attempt to print a ticket. The recorded information must be accurate or the software must not process and print a ticket with erroneous data interpreted as a measured amount.

Weighing Devices

6. Motion detection.

   6.1. For railway track, livestock, and vehicle scales, apply or remove a test load of at least 15d while simultaneously operating a print button, push-button tare or push-button zero. A good way to do this is to try to print a ticket while pulling the weight truck or another vehicle onto the scale. Recorded values shall not differ from the static display by more than 3d. Perform the test at 10 %, 50 % and 100 % of the maximum applied test load. S.2.5.1(a) [2.20]; EPO NO. 2-3, 2.4.

   6.2. For all other scales, apply or remove at least 5d. Printed weight values must agree with the static weight within 1d and must exactly agree with other indications. S.2.5.4.(b) [2.20]; EPO NO. 2-3, 2.4.

7. Behind zero indication.

   7.1. Apply a load in excess of the automatic zero setting mechanism (AZSM) and zero the scale. S.2.1.3. [2.20]; EPO NO. 2-3, 2.4., 2.5.2.

   Example: On a vehicle scale have someone stand on the scale, then zero them off (AZSM is 3d). Remove the weight (person) and note the behind zero display (usually a minus weight value) or error condition.

   7.2. Attempt to print a ticket. With a behind zero condition, (manually or mechanically operated) a negative number must not be printed as a positive value.

8. Over capacity.

   8.1. Manually enter a gross weight if permissible or apply a test load in excess of 105 % of the scale's capacity. S.1.7. [2.20]; S.1.12., UR.3.9. [2.20]

   8.2. Attempt to print a weight ticket. A system must not print a ticket if the manually entered weight or load exceeds 105 % of the scale capacity.

Measuring Devices

9. Motion detection.

    9.1. Initiate flow through the measuring element. Attempt to print a ticket while the product is flowing through the measuring chamber. The device must not print while the indication is not stable. S.2.4.1. [3.30]

10. Over capacity.

    10.1. Attempt to print a ticket in excess of the indicated capacity. A system must not print a ticket if the device is manually or mechanically operated in excess of the indicated value.

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

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

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

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

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

Discussion:
It was suggested by Mr. Truex and Mr. Flocken that we make it part of our report as an attachment or an appendix of the meeting minutes. Then we can send out an e-mail notifying the Software Sector members as to where to find it.

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

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

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

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

NEW ITEMS

7. Retrieval of Audit Log information

Source:
Adam Oldham, Gilbarco

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

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

The United States has rather unique requirements for printing the Category 3 audit trail, which are quite unwieldy – both in terms of the actual printing process (and results), as well as the needed approvals (the example provided by Mr. Oldham required an approval for each and every POS system that might be connected to their system). The most similar is from Mexico, but they require an electronic copy.

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

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

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

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

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

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

8. Next Meeting

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

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

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

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

9. 2015 NCWM Interim Meeting Report

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

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

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

10. 2015 International Report

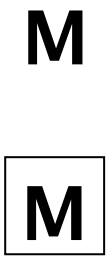
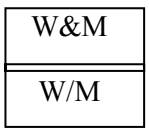
Dr. Ambler Thompson, NIST, Office of Weights and Measures (OWM), provided a synopsis of international activity relating to the work of the Sector. Highlights of interest to the NTEP Software Sector:

OIML D 31 is due to be updated, but there has been no activity. They have still not addressed field verification of software.

The terminology "inextricably linked" is under debate.

WELMEC 7.2 has superseded WELMEC 7.1.

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

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

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Appendix B
Final Attendee List

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APPENDIX F

NATIONAL TYPE EVALUATION PROGRAM (NTEP) WEIGHING SECTOR MEETING SUMMARY

August 25 - 26, 2015
Denver, Colorado

INTRODUCTION

The charge of the NTEP Weighing Sector (WS) is important in providing appropriate type evaluation criteria based on specifications, tolerances, and technical requirements of NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," Sections 1.10. General Code, 2.20. Scales, 2.22. Automatic Bulk Weighing Systems, and 2.24. Automatic Weighing Systems. The Sector's recommendations will be presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14, "Technical Policy, Checklists, and Test Procedures" for national type evaluation.

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

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in ***italics***. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is the policy of the National Institute of Standards and Technology (NIST) to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references in U.S. customary units.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing Systems	NCWM	National Conference on Weights and Measures
AREMA	American Railway Engineering Maintenance-of-Way Association	NTEP	National Type Evaluation Program
AWS	Automatic Weighing Systems	OIML	International Organization of Legal Metrology
CC	Certificate of Conformance	OWM	Office of Weights and Measures
DES	Digital Electronic Scales	R	Recommendation
IZSM	Initial Zero-Setting Mechanism	SS	National Type Evaluation Program Software Sector
LMD	Liquid Measuring Device	S&T	Specifications and Tolerances Committee
MC	Measurement Canada	SMA	Scale Manufacturers Association
MRA	Mutual Recognition Agreement	WS	National Type Evaluation Program Weighing Sector

Details of All Items
(In order by Reference Key)

CARRY-OVER ITEMS

1. Recommended Changes to NCWM Publication 14 Based on Actions at the 2015 NCWM Annual Meeting

Source:
Mr. Richard Harshman, National Institute of Standards and Technology (NIST) Technical Advisor, provided the Sector with specific recommendations for incorporating test procedures and checklist language based upon actions of the 2015 NCWM Annual Meeting. The Sector is asked to briefly discuss each item and, if appropriate, provide general input on the technical aspects of the issues.

1.a. Item 310-2 G-UR.4.1. Maintenance of Equipment.

Source:
2015 S&T Committee Final Report

Background/Discussion:
At the 2015 NCWM Annual Meeting, NCWM voted to amend NIST Handbook 44 paragraph G-UR.4.1. Maintenance of Equipment as follows:

> **G-UR.4.1. Maintenance of Equipment.** – All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service at a single place of business ~~**found to be in error predominantly in a direction favorable to the device user (Also see the Introduction, Section Q**~~) shall not be considered "maintained in a proper operating condition~~.~~" **if:**
>
> **a. predominantly, equipment of all types or applications are found to be in error in a direction favorable to the device user, or**
>
> **b. predominantly, equipment of the same type or application is found to be in error favorable to the device user.**
>
> (Amended 1973**,** ~~**and**~~ 1991**, and 2015**)

Recommendation:
Mr. Harshman, NIST Technical Advisor, believes that no changes are required for NCWM Publication 14 and that no further actions by the WS are necessary. This item was included on the Sector's agenda to make members aware of the changes to the paragraph. The S&T Committee's interpretation of the second sentence of paragraph G-UR.4.1., in consideration of the changes that were adopted, is that predominance could be applied to equipment of the same type (e.g., all the retail motor fuel dispensers at a fueling station) and the same application (e.g., all devices, regardless of type, used in a commercial application) at a single place of business.

Conclusion*:*
No action was recommended nor taken by the WS on this item.

1.b. Item 320-1 T.N.3.5. Separate Main Elements.

Source:
2015 S&T Committee Final Report

Background/Discussion:
At the 2015 NCWM Annual Meeting, NCWM voted to amend NIST Handbook 44 Scales Code paragraph T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc. as follows:

> **T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc**. – If a main element separate from a **complete** weighing device is submitted for **laboratory** type evaluation, the tolerance for the **main** element is 0.7 that for the complete weighing device. This fraction includes the tolerance attributable to the testing devices used.

Recommendation:
Scales Code Paragraph T.N.3.5. is referenced in NCWM Publication 14 DES Section 57 Device Tolerances and has been copied below. Footnote 6, which appears beneath the tolerances table in Section 57 explains how tolerances are to be applied to separate main elements.

57. Device Tolerances

Code References: G-T.1. (e), T.N.3.2., T.N.3.5. and Table 6.

The acceptance tolerances for complete scales are shown below and apply to complete devices and separable main elements during type evaluation.

Acceptance Tolerances (All values in this table are in scale divisions)				
Tolerance in Scale Divisions				
Complete Devices	0.5	1.0	1.5	2.5
Separable Main Elements[6]	0.35	0.7	1.05	1.75
Separable Indications w/o Expanded Resolution	0	0	1	1
Class	**Test Load**			
I	0 - 50 000	50 001 - 200 000	200 0001 +	
II	0 - 5 000	5 001 - 20 000	20 0001 +	
III	0 - 500	501 - 2 000	2 001 - 4 000	4 001 +
IIII	0 - 50	51 - 200	201 - 400	401 +
III L	0 - 500	501 - 1 000	(Add 1/2d for each additional 500d or fraction thereof)	

It is strongly recommended that indicating elements submitted separately for evaluation have a test mode providing reading indications to 0.1e to provide adequate resolution to apply the tolerance (expanded resolution). If the indicator provides indications to only the maximum number of divisions requested for the Certificate of Conformance, the tolerance will be truncated to the number of divisions that can be indicated.

[6]When main elements (indicating elements and weighing/load-receiving elements) are tested separately, the tolerance applied to all laboratory tests (influence factors and permanence tests) are 0.7 times the acceptance tolerance for complete scales.

Mr. Harshman believes that footnote 6 adequately explains how tolerances are to be determined for main elements evaluated separately and that no changes are needed. However, the Sector might consider amending footnote 6 as follows to be consistent with the changes to T.N.3.5. that were adopted:

> [6] When main elements (indicating elements and weighing/load-receiving elements) are tested separately **from a complete weighing device**, the tolerance applied to all laboratory tests (influence factors and permanence tests) **of those main elements shall be** ~~are~~ 0.7 times the acceptance tolerance **applicable to** ~~for~~ complete scales.

Conclusion:
In considering this item, members of the Sector agreed that footnote 6, which is an added comment associated with the term "Separable Main Elements" in the Tolerance Table included in Section 57 of NCWM Publication 14 DES, is clear and adequately explains how tolerances are to be determined for main elements evaluated separately. Consequently, the Sector agreed that no amendments to the footnote are needed.

1.c. Item 320-5 Part 2.20. Weigh-In-Motion Vehicle Scales for Law Enforcement – Work Group

Source:
2015 S&T Committee Final Report

Background/Discussion:
At the 2015 NCWM Annual Meeting, NCWM voted to adopt a new NIST Handbook 44 device code applicable to weigh-in-motion (WIM) systems used for vehicle enforcement screening and include it in Section 2 of NIST Handbook 44, assigning it a new code reference number "2.25." The new code was adopted as "tentative," meaning it will be in a trial or experimental status and not intended to be enforced until such time that the tentative status is removed. Removal of the tentative status requires NCWM adoption of a proposal to remove it, which would then make the code fully enforceable. Definitions of terms used in the code were also adopted in support of the new code and will appear at the end of the code. The new code, titled "Weigh-In-Motion Systems used for Vehicle Enforcement Screening," along with the definitions of terms appearing in the code are included in this agenda as an attachment to Agenda Item 1.c.

Recommendation:
Mr. Harshman, NIST Technical Advisor, believes that no changes are required for NCWM Publication 14 and that no further actions by the Sector are necessary at this time. However, should NCWM decide to develop type evaluation criteria for the different components of WIM systems as a result of the new code being added to NIST Handbook 44, the WS may be called upon to help develop these criteria, including a new type evaluation checklist for the NTEP evaluators to use when evaluating such equipment.

Discussion/Conclusion:
Mr. Darrell Flocken (NCWM) reported that following adoption of the new NIST Handbook 44 device code applicable to WIM systems used for vehicle enforcement screening at the 2015 NCWM Annual Meeting, some manufacturers of WIM equipment contacted NTEP and expressed interest in having NTEP evaluate their equipment. He suggested the next task for the WIM Work Group (WG) might be to develop type evaluation criteria for NCWM Publication 14 intended to apply to this equipment.

In discussing this item, it was stated that the application of the new NIST Handbook 44 Weigh-In-Motion Systems Used for Vehicle Enforcement Screening Code is for equipment that will be used for screening purposes only. An industry member questioned why weights and measures would be interested in regulating such equipment.

Mr. Flocken, who served as Chairman of the WIM WG and Mr. Rick Harshman (OWM), who served as NIST Technical Advisor to the same WG responded to this question by providing an explanation of the application of NIST Handbook 44; that is, to equipment being used in either a commercial or law enforcement application. They noted that the weighing results obtained from these systems are used in a law enforcement application to determine whether vehicles are to be immediately directed back onto the roadway or onto a certified static scale for final weight determination. If directed onto a certified static scale, the results of weighing the vehicle statically are used to determine whether or not a fine gets imposed and, if so, the amount of the fine. During early development of the new Code, the U.S Federal Highway Administration reported that the weighing results from WIM systems are sometimes being contested in court proceedings based on the argument there are no documented performance standards for which these devices must comply; yet, the weighing results obtained from these systems are used as the determining factor on whether or not vehicles get released back onto the roadway or detained to be reweighed on a static scale for possible citation.

No action was recommended nor taken by the Sector on this item.

1.d. Item 360-3 Appendix D – Definitions. point-of-sale-system.

Source:
2015 S&T Committee Final Report

Background/Discussion:
At the 2015 NCWM Annual Meeting, NCWM voted to amend the definition of point-of-sale system in NIST Handbook 44 Appendix D as follows:

> **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. **The system components, when operated together must be capable of the following:**
>
> **1. determining the weight or measure of a product or service offered;**
>
> **2. calculating a charge for the product or service based on the weight or measure and an established price/rate structure;**
>
> **3. determining a total cost that includes all associated charges involved with the transaction; and**
>
> **4 providing a sales receipt.**
>
> [2.20, 3.30, 3.32, 3.37]
>
> (Added 1986) (Amended 1997 **and 2015**)

Although amended based on a recommendation by the USNWG on Taximeters (the submitter of the S&T Agenda Item), the definition, as amended, applies not only to the Taximeters Code, but also to other device codes in NIST Handbook 44; one of which is likely to be of interest to some members of the WS; Section 2.20., the Scales Code.

Recommendation:

Mr. Harshman, NIST Technical Advisor, believes that no changes are required for NCWM Publication 14 and that no further actions by the WS are necessary. This item was added to the Sector's agenda to make members aware of the changes to the definition.

Discussion/Conclusion*:*
No action was recommended nor taken by the Sector on this item.

2. Acceptable Symbols/Abbreviations to Display the CC Number Via a Device's User Interface

Sources:

- 2010-2014 Final Reports of the S&T Committee: **https://www.ncwm.net/meetings/annual/meeting-reports**
- 2015 Final Report of the S&T Committee: **https://www.nist.gov/pml/wmd/ncwm-2015-annual-report-sp-1210**
- 2008-2013 Software Sector summaries: **http://www.ncwm.net/committees/ntep/sectors/software/archive**
- 2013-2014 Weighing Sector summaries: **http://www.ncwm.net/committees/ntep/sectors/weighing/archive**

Background:
Local weights and measures inspectors need a means to determine whether equipment discovered in the field has been evaluated by NTEP. If so, the inspector needs to know at a minimum the CC number. From this starting point, other required information can be ascertained (e.g., the software version or revision identifier of the software installed in an electronic device at the time it was evaluated). NIST Handbook 44 currently includes three options for marking of the CC:

1. Permanent marking
2. Continuous display
3. Recall using a special operation

Among other tasks, the SS was charged by the NCWM Board of Directors to recommend NIST Handbook 44 specifications and requirements for software incorporated into weighing and measuring devices, which may include tools used for software identification. During its October 2007 meeting, the SS discussed the value and merits of required markings for software, including possible differences in some types of software-based devices and methods of marking requirements.

In 2008, the Software Sector (SS) developed and submitted a proposal to the NCWM S&T Committee to modify G-S.1. and associated paragraphs to reflect these technical requirements. Between 2008 and 2011, this item appeared on the S&T Committee's main agenda and the Committee and the SS received numerous comments and suggestions relative to the proposal. The SS developed and presented several alternatives based on feedback from weights and measures officials and manufacturers. Among the key points and concerns raised during discussions over this period were how to address the following:

(a) **Limited Character Sets and Space.** – How to address devices that have limited character sets or restricted space for marking.

(b) **Built-for-Purpose vs. Not-Built-for-Purpose.** - Whether or not these should be treated differently.

(c) **Ease of Access.** – Ease of accessing marking information in the field:

(1) complexity of locating the marking information;

(2) use of menus for accessing the marking information electronically;

(3) limits on the number of levels required to access information electronically; and

(4) possibility of single, uniform method of access.

(d) **Hard Marking vs. Electronic.** – Whether or not some information should be required to be hard marked on the device.

(e) **Continuous Display.** – Whether or not required markings must be continuously displayed.

(f) **Abbreviations and Icons.** – Establishment of unique abbreviations, identifiers, and icons and how to codify those.

(g) **Certificate of Conformance Information.** – How to facilitate correlation of software version information to a CC, including the use of possible icons.

Further details on the alternatives considered can be found in the S&T Committee's Final Reports from 2008 to 2014, and the SS summaries from 2009-2013.

During its 2013 meeting, the WS reviewed and provided feedback to the SS on a proposal to amend NIST Handbook 44 General Code Paragraphs G-S.1.Identification and G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices. See the 2013 Weighing Sector Meeting Summary to review the feedback provided by the WS on the proposal and for additional background information on this item.

Prior to the 2014 WS meeting, members of OWM's Legal Metrology Devices Program (LMDP) amended the proposal considered by the WS at its 2013 meeting; this after being asked by the SS to provide additional input and modify G-S.1. and G.S.1.1. in consideration of the goals of the SS and the comments provided during the 2014 Open Hearings of the S&T Committee relating to this item.

The following is a list of the goals provided by the SS in modifying G-S.1. and G.S.1.1. as communicated to the members of OWM's LMDP:

1. Remove the existing distinction between software identification requirements for built-for-purpose and not-built-for-purpose devices.
2. To require that <u>all</u> software-based devices have a software version or revision identifier for metrologically significant software.
3. Require that <u>certified</u> software versions or revision identifiers for metrologically significant software is recorded on the CC for access by inspectors.
4. Software itself does not require serial numbers.
5. Require that software-based devices version or revision identifier shall be accessible via the display and user interface and only if device's display is incapable of displaying the identifier or has no display and/or interface; then permanently marking the version or revision identifier shall be acceptable (e.g., digital load cell).
6. Nonretroactive as of January 1, 2016, if passed by the NCWM in July 2015.

OWM's LMDP developed the following proposed draft alternative changes to G-S.1. based on the SS's request for additional input on how best to meet its goals and forwarded them to the Chairman of the SS for consideration at the 2014 WS/SS joint meeting:

Amend NIST Handbook 44*:* 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. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect**,** shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The

abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ~~***not built-for-purpose software-based devices***~~ ***software****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices~~;~~ **manufactured as of January 1, 2004 through December 31, 2015, and all software based devices or equipment manufactured as of January 1, 2016;**
~~***[Nonretroactive as of January 1, 2004]***~~
(Added 2003) (Amended **20XX)**

(1) The version or revision identifier shall be:
i. prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;
[Nonretroactive as of January 1, 2007]
(Added 2006)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2016]
(Added 20XX)

iii. continuously displayed* or be accessible via the display menus. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2016]
(Added 20XX)

****The version or revision identifier shall be displayed continuously on software-based equipment with a digital display manufactured as of January 1, 20XX and all software-based equipment with a digital display as of January 1, 20YY.***

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

(1) *The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)*
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999, 2000, 2001, 2003, **~~and,~~** 2006 **and 201X**)

G-S.1.1. Location of Marking Information for ~~Not Built For Purpose~~ All Software-Based Devices. *– For ~~not built for purpose,~~ software-based devices, 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 20XX**)

No changes to subparagraph G-S.1.1. were proposed by OWM's LMDP since the SS had indicated earlier that it may be possible to eventually eliminate G-S.1.1. Thus, the proposed changes to subparagraph G-S.1.1. shown above in OWM's draft alternative changes are those originating from the SS's 2013 proposal.

In providing feedback to the SS, OWM's LMDP noted that the shaded portion of G-S.1.(d)(1)iii. of their draft alternative changes was developed solely by OWM (i.e., does not reflect any of the goals communicated by the SS) and was being offered for consideration with the understanding that:

1. this change will make it easier in the future for inspectors to be able to identify software installed in equipment;
2. a reasonable amount of time for the changes to take effect can be specified;
3. it is probable that improvements in technology over time will make it easier for equipment manufacturers to comply.

In addition to the alternative changes proposed by OWM's LMDP, a member of the SS submitted the following definition of "software-based devices" for discussion during the joint meeting of the Weighing and Software Sectors and possible future inclusion into Appendix D of NIST Handbook 44:

software-based devices: devices used to compute and control processes using software, where software is a general term for the programs and data used to operate the computers and/or related electronic devices. Software-based device may also consist of just software (e.g., weigh in/weigh out software).

At its 2014 meeting, the WS met jointly with the SS to consider the proposal as amended by OWM's LMDP. After further amending the proposal, the two sectors agreed to submit the following proposal to the regional associations for consideration and requested its status be change from Developing to Informational.

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

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

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ~~***not built-for-purpose software-based software devices***~~ ***software****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices~~;~~ **manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2020;**
~~***[Nonretroactive as of January 1, 2004]***~~
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be:

i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

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

(Added 20XX)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2020]

(Added 20XX)

iii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2020]

(Added 20XX)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). ***Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]

(Added 2006)

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

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~and,~~ 2006 **and 201X**)

Technical Advisor's note: *Although the SS had earlier proposed changes to G-S.1.1., it was decided during the joint meeting that no changes to G-S.1.1. were necessary since the sectors had agreed to retain the term "not-built-for-purpose software-based devices" in G-S.1.(d). Thus, no changes are proposed to paragraph G-S.1.1. Members of the two sectors also reviewed the draft definition of "software-based devices." The draft definition had been developed by a member of the SS in consideration of a comment that had been received by the S&T Committee during one of the 2014 NCWM Conferences. The sectors agreed that no action was currently necessary other than that the definition be retained for future consideration should the need develop.*

See the 2013 and 2014 Weighing Sector Meeting Summaries for additional details.

Recommendation:
No recommendation is being made at this time. A joint meeting of the MS and SS is planned for September 2015 to further consider the proposal as amended by the SS and WS during their joint meeting. This item also appears on the 2015 S&T Committee's agenda as a Developing item (agenda Item 310-1). The NIST Technical Advisor will provide an update on the progress of this item to the Sector.

Conclusion:
Mr. Rick Harshman (OWM) provided an update to the Sector on this item and noted that the proposal developed at last year's joint meeting between the WS and SS had not been changed and would be considered by the Measuring Sector at a September 2015 joint meeting between the Measuring Sector and SS. No action was recommended nor taken by the WS as it agreed to await the outcome of this upcoming joint meeting before taking any additional action.

3. NCWM Publication 14 DES Section D. Substitution of Load Cells, Load Cells Section 5.

Source:
NCWM/NTEP (2014)

Background:
Current Load Cell Substitution Policy is outdated and needs to be revised to include the use of new load cell output technology and to make the requirements less open to interpretation.

At its 2014 meeting, the WS considered the following proposal to replace the current load cell substitution policy in Section D. *Substitution of Load Cell in Scales* on Page DES-11 and Section *5. Substitution of Metrologically Equivalent Load Cells in Scales* on Page LC-2 of the 2014 edition of NCWM Publication 14, Weighing Devices:

In a Weighing/Load Receiving Element with a single or multiple load cells installed, the replacement of one or more load cells, from the same or a different manufacturer, is considered a metrologically equivalent replacement provided requirements (1) through (7) below are met.

1. **The original and the replacement load cells have a Certificate of Conformance from having been evaluated individually and not as a component in a complete weighing instrument.**
2. **Have as many or more verification scale intervals (n_{max}) as required for the scale's capacity and division size.**
3. **Have a minimum load cell verification interval (v_{min}) that is suitable for the application.**
4. **Are of the same load cell design as the cell being replaced. Note: load cell design defines the physical design of the load cell. e.g. canister compression, dual ended shear beam, etc.**
5. **Have a capacity equal to or greater than 85 % of the capacity of the load cells installed during type evaluation testing.**
6. **Can be placed in the scale without any modification, as defined in Publication 14, Digital Scales Code, Technical Policy, to the basic design of the Load Receiving Element or the load cell mounting assembly. Note: The use of spacers to compensate for differences in load cell height is permitted.**
7. **Utilize the same output technology (e.g., analog, digital, hydraulic, etc.) as all other load cells in the system or weighing element. Note: For replacement load cells with analog output technology; the same wiring configuration must be maintained as the cells being replaced without adding jumper wires, connecting sense wires to excitation wires, or by removing the sense leads.**

In a system with multiple load cells, the replacement of ALL load cells in the system with National Type Evaluation Program certified and compatible load cells that have an output technology different than the original load cell is considered a metrologically equivalent replacement provided all requirements in (1) through (6) above are met.

During the discussion of this item at the 2014 WS Meeting, it was noted that Item 4 of the current load cell substitution policy specifies that load cells to be substituted must be of the same basic type as the cells being replaced. Thus, in order to correctly apply Item 4. of the current load cell substitution policy, one must have knowledge of the different

variables that establish load cell type. No explanation of the criteria or factors that were intended to be used to establish same basic type is provided in the policy, nor are any examples of different types of load cells given. Thus, the policy leaves open for interpretation the different factors that establish load cell type.

Much of the 2014 discussion by the Sector on this item involved attempts in identifying the criteria or factors that define the "type" (or "design") of a load cell. There was no consensus reached by the Sector regarding what those factors are or should be. Members of the Sector offered many suggestions of the different factors that they believed might or should define type to include: the method of force introduction, output characteristic, output capacity, impedance, supply voltage, material used in its construction, method of construction, shape, etc. The Sector concluded that the word "design" encompasses many characteristics of a load cell.

The Sector considered whether the load cell substitution policy is intended to apply to the replacement of all the load cells in a scale or just some of the load cells and concluded that the proposed alphabetic list of requirements is intended to apply only to the replacement of one or more load cells in a scale but not full replacement of all the cells.

The Sector agreed at its 2014 meeting to recommend the following changes to the proposal based on comments heard from its members during the discussion of this item:

- Item 4. in the proposed list, should read as follows:

  Are of the same basic physical characteristic load cell design as the cell being replaced. Note: load cell design defines the physical design of the load cell. E.g. canister compression, dual ended shear beam, etc.

- The following sentence is to replace the sentence in Item 5. of the proposed list:

  Have a capacity that is greater than or not less than 85 % of the capacity of the original cell.

- It was suggested that the following two sentences be added to the end of the proposed list:

  1) **The replacement of a load cell(s) resulting in a combination of analog, digital, or hydraulic load cells in one system is not considered a metrologically equivalent replacement.**

  2) **All load cells in a multiple load cell system must have the same type of output (e.g. all analog, all digital, or all hydraulic.)**

The Sector also agreed that additional work on this item was still needed and that it was to remain on next year's (2015) WS agenda. Mr. Darrell Flocken (NTEP) agreed to rewrite the proposal and take into account the changes agreed to by the Sector and to make clear the intended application of the numbered list of requirements that establish the load cell substitution policy.

Recommendation:
The Sector is asked to consider the following revised proposal for the load cell substitution policy, which was recently updated by Mr. Flocken for consideration at the 2015 WS Meeting:

Revised Proposal for the Load Cell Substitution Policy:

In a Weighing/Load Receiving Element with a single or multiple load cells installed, the replacement of one or more load cells, from the same or a different manufacturer, is considered a metrologically equivalent replacement provided requirements (1) through (7) below are met.

1. The original and the replacement load cell or load cells have a Certificate of Conformance from having been evaluated individually and not as a component in a complete weighing instrument.

2. Have as many or more verification scale intervals (n_{max}) as required for the scale's capacity and division size.

3. Have a minimum load cell verification interval (v_{min}) that is suitable for the application.

4. Are of the same basic physical characteristic load cell design as the cell being replaced. Note: load cell design defines the physical design of the load cell, e.g., canister compression, dual ended shear beam, etc.

5. Have a capacity that is greater than or not less than 85% of the capacity of the original load cell.

6. Can be placed in the scale without any modification, as defined in Publication 14, Digital Scales Code, Technical Policy, to the basic design of the Load Receiving Element or the load cell mounting assembly. Note: The use of spacers to compensate for differences in load cell height is permitted.

7. Utilize the same output technology (e.g., analog, digital, hydraulic, etc.) as all other load cells in the system or weighing element. Note: For replacement load cells with analog output technology; the same wiring configuration must be maintained as the cells being replaced without adding jumper wires, connecting sense wires to excitation wires, or by removing the sense leads.

In a system with multiple load cells, the replacement of ALL load cells in the system with National Type Evaluation Program certified and compatible load cells that have an output technology different than the original load cell is considered a metrologically equivalent replacement provided all requirements in (1) through (6) above are met.

a) The replacement of a load cell(s) resulting in a combination of output technology as stated in item (7) in one Weighing/Load Receiving Element is not considered a metrologically equivalent replacement.

b) All load cells in a multiple load cell system must have the same type of output (e.g. all analog, all digital, or all hydraulic.)

Discussion/Conclusion:
With respect to Requirement 5. of the revised proposal for the load cell substitution policy, an industry member asked, "If the original load cell is replaced with one that has a capacity equal to 85 % of the original load cell and then that load cell needs to be replaced at some later date, how would one know that the original load cell had been replaced previously? That is, unless replacement of a load cell is documented and made known to a technician performing work on a scale, then couldn't the 85 % allowable reduction in load cell capacity be applied multiple times?" In response to this concern, Mr. Darrell Flocken (NCWM) acknowledged that this further reduction in load cell capacity quite possibly could occur. He reminded members of the Sector that it had been agreed at last year's meeting, the additional reduction in load cell capacity isn't of critical concern providing the V_{min} formula in Scales Code paragraph S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division is met and the device meets accuracy requirements when tested with the replacement load cell(s) installed. Several members of the Sector acknowledged agreement.

It was noted by another industry member that the policy, as revised, would *not* allow a six-wire load cell to be replaced with one that has only four-wires; yet, in some cases, such replacement could be deemed acceptable and the scale receiving the replacement six-wire cell(s) would still be capable of performing within accuracy requirements. Today's technology also makes possible the use of different types of cells in a system (e.g., hydraulic, digital, and analog). Several members of the Sector voiced agreement with these points. In response to these additional comments, Mr. Flocken stated that the intent of Requirement 4. is to prevent the mixing of technology (e.g., canister compression with dual ended shear beam, etc.) The intent of Requirement 6. is to prevent substituting a particular type of load cell with another of the same type, for example, substituting a canister load cell with another canister load

cell that is, perhaps, of different dimension (e.g., taller) than the one currently used. The Sector concluded that no additional changes were needed to the proposal as revised by Mr. Flocken for consideration at the 2015 WS Meeting, and agreed to recommend the proposal (as shown in the text box above and beneath the title, "Revised Proposal for the Load Cell Substitution Policy") be inserted into Publication 14 to replace the current policy.

NEW ITEMS

4. NIST Handbook 44 Scales Code Paragraph S.5.4 Relationship of Load Cell Verification Interval Value to the Scale Division

Source:
NCWM/NTEP

Background:
NTEP has identified two different interpretations of how to apply the formula specified in NIST Handbook 44, Scales Code, paragraph S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division; specifically, to bulleted item (a). The formula determines the suitability of the v_{min} value of a load cell in relationship to the value of the scale division (d) for scales without lever systems. The different interpretations occur only when applying the formula to a scale having multiple platforms (Weighing/Load Receiving Elements (W/LRE)) where the output of each W/LRE has its own weight display and is capable of operating as an independent scale in a commercial application.

Consider the number of load cells in each W/LRE of the following example scale and how the formula is to be applied:

Platform	Number of Load Cells
1	4
2	4
3	6

The first interpretation applies the formula to the three W/LREs as a single platform using the total of all load cells (14) for the value of "N" in the formula.

The second interpretation applies the formula to each of the three W/LRE's individually using only the number of load cells (4, 4, and 6) in the W/LRE for the value of "N" in the formula.

Recommendation:
This item appeared on the Sector's 2014 agenda, but there was no action taken on it during the 2014 WS meeting. The reason no action was taken is because not all stakeholders were in attendance when this item was first introduced during the 2014 WS meeting due to conflicting NCWM announcements of the meeting start time. Consequently, the NCWM agreed to reintroduce this item at the 2015 WS Meeting in the interest of fairness to all.

Most recently, there have been two NCWM Form 15 proposals submitted to NCWM proposing changes to Scales Code paragraph S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division. The regional weights and measures associations will consider those proposals at their fall 2015 meetings (for the 2016 NCWM cycle). It is recommended that this item be held open on the Sector's agenda pending the outcome of the two proposals by the S&T Committees.

Discussion/Conclusion:
The Sector agreed *not* to take a position on this item given that there are two NCWM Form 15 proposals that have been submitted to the NCWM proposing amendments to Scales Code paragraph S.5.4. and will be considered by the different regional weights and measures associations during their upcoming fall 2015 meetings.

5. NCWM Publication 14 ABWS Technical Policy Section E. Automatic Bulk Weighing Systems - NTEP On-Site Evaluation, and ABWS Checklists Paragraph 32

Source:
NCWM/NTEP

Background:
Current Technical Policy, Section E, of the Automatic Bulk Weighing Systems (ABWS) Code states:

> During laboratory evaluation, the bulk weighing controller is tested under simulated field conditions; therefore, the results of such an evaluation should not be used to determine compliance with all pertinent requirements. Compliance with all requirements shall be determined only when the bulk weighing controller, having successfully passed National Type Evaluation Program laboratory evaluation, is installed and tested under actual field conditions as part of an automatic bulk weighing system.

In addition, Paragraph 32. Performance and Permanence Tests for Automatic Bulk Weighing Systems of the ABWS Code states:

> The tests described here, apply to the entire automatic bulk weighing system, (e.g., the bulk weighing scale controller interfaced with the weigh hopper, load cell(s), material handling system, etc.). It is assumed that all components of the automatic bulk weighing scale controller have already been examined and found to comply with applicable National Type Evaluation Program requirements. If the design and performance of the bulk weighing controller is to be determined during the same test, the applicable requirements for automatic bulk weighing systems must be referenced.

The wording implies that a complete evaluation of the weighing controller is not possible without connecting the weighing controller to an actual hopper. After discussing this with the NTEP Labs and a few manufacturers it was concluded that the weighing control can receive a complete evaluation in the lab with proper simulation.

Recommendation:
The following changes to Section E. of the ABWS Technical Policy and to Paragraph 32. of the ABWS Checklist are suggested to eliminate the requirement of having to test the weighing controller under field conditions providing a complete simulated test can be conducted during lab evaluation:

E. Automatic Bulk Weighing Systems - NTEP On-Site Evaluation

During laboratory evaluation, the bulk weighing controller is tested under simulated field conditions.~~;~~ ~~**therefore, the results of such an evaluation should not be used to determine compliance with all pertinent requirements. Compliance with all requirements shall be determined only when the bulk weighing controller, having successfully passed National Type Evaluation Program laboratory evaluation, is installed and tested under actual field conditions as part of an automatic bulk weighing system.**~~ **If the simulation is not capable of simulating all functions and operations of a complete system; the weighing controller is to be installed and all functions or operations not simulated during the laboratory evaluation are to be tested under actual field conditions as part of an automatic bulk weighing system.**

32. Performance and Permanence Tests for Automatic Bulk Weighing Systems

Performance tests are conducted to ensure compliance with the tolerance requirements of NIST Handbook 44 and for systems used to weigh grain with additional requirements of the GIPSA.

The tests described here, apply to the entire automatic bulk weighing system, (e.g., the bulk weighing scale controller interfaced with the weigh hopper, load cell(s), material handling system, etc.) ~~**It is assumed that**~~

~~all components of the automatic bulk weighing scale controller have already been examined and found to comply with applicable National Type Evaluation Program requirements.~~ If the design and performance of the bulk weighing controller is to be determined during the same test, the applicable requirements for automatic bulk weighing systems must be referenced.

…

Discussion/Conclusion:
Mr. Darrell Flocken (NCWM) introduced this item to the Sector and stated that it is the view of NTEP that a field evaluation of a bulk system controller in actual use and connected to other components of an ABWS is not needed in order to sufficiently evaluate it. He also stated that not everyone agreed with this assessment and that NTEP had received a written list of comments from Mr. Henry Oppermann (Weights and Measures Consulting, LLC), who opposed the item and had asked that his list of comments be reviewed during the Sector meeting. Mr. Oppermann's comments were projected onto a screen for all to see and reviewed individually in the order appearing on his list by the Sector. Mr. Darrell Flocken (NCWM) led the Sector's review and discussion of each item on Mr. Oppermann's list as follows:

Automatic Bulk Weighing Systems *(submitted by Mr. Henry Oppermann to NTEP for Review and Discussion at the 2015 Sector Meeting)*

NTEP is to provide a minimum level of evaluation to ensure that a weighing or measuring system complies or is capable of complying with the specifications and tolerances of H44.

1. The question is, "What level of evaluation is needed to provide the minimum level of evaluation to ensure that a measuring instrument is capable of complying with H44?"

2. An ABWS is a measuring system for a dynamic weighing process. As a minimum, NTEP should test and evaluate the system when operating under normal conditions in an actual application.

    a. The installation characteristics for the different inputs to the ABWS are not fully simulated in a laboratory test.

    b. There are venting concerns around the hopper, the speed of operation, and the timing of the gates that can affect the weight signals generated by the W/LRE. The type evaluation should verify that the ABWS controller is capable of dealing with the varying weighing signals.

    c. The shutoff of the flow of product into the hopper is a variable that the ABWS must address. The rate of flow of product varies with the capacity of the hopper. This cannot be assessed adequately in the laboratory.

    d. The stabilizing of the weight values depend upon the field installation. At a minimum, the type evaluation should look at this characteristic in a field application.

3. Would NTEP test any of the following devices without examining its operational and performance capability in an actual application?

    a. Coupled-in-motion or uncoupled-in-motion railway track scale

    b. An in-motion monorail scale

    c. An automatic checkweigher

4. Although the characteristics of each ABWS installation may be unique to the installation, what is expected and what should NTEP evaluate in the type evaluation of an ABWS?

NTEP should make sure that the type evaluation includes an actual field installation to verify that the inputs actually exist in a real installation

During the review, several members of the Sector commented that they agreed with many of the points made by Mr. Oppermann. An industry member commented that he understood the purpose of the field evaluation was to prove a bulk weighing controller capable of being able to comply with all existing requirements when connected to other parts of an ABWS and operated under normal use. Mr. Doug Musick (Kansas) questioned whether or not simulated tests, alone, were adequate. A second industry member noted that the results of a field test are no guarantee that a bulk weighing controller will operate correctly in every application and installation. Several of the NTEP evaluators participating in the meeting voiced agreement with the comment made by the second industry member. There was a general consensus amongst the Sector that *initial verification*, as opposed to *type evaluation*, confirms correct operation; that is, that a controller is working properly for a particular application.

Prior to Voting on this item, Mr. Flocken stated that a vote of agreement to the changes proposed to Section E. of the ABWS Technical Policy would also constitute a vote of agreement to the changes proposed to Paragraph 32. of the ABWS Checklist.

A single vote was then taken to amend both the policy and checklist. Results were as follows: 16 in favor, none opposed, and 1 abstained. There were 5 NTEP evaluators, 11 manufacturers, and a NIST T/A, who voted. The Sector agreed to recommend the following changes to Section E. of the ABWS Technical Policy and to Paragraph 32 of the ABWS Checklist:

E. Automatic Bulk Weighing Systems - NTEP On-Site Evaluation

During laboratory evaluation, the bulk weighing controller is tested under simulated field conditions.~~; therefore, the results of such an evaluation should not be used to determine compliance with all pertinent requirements. Compliance with all requirements shall be determined only when the bulk weighing controller, having successfully passed National Type Evaluation Program laboratory evaluation, is installed and tested under actual field conditions as part of an automatic bulk weighing system.~~ **If the simulation is not capable of simulating all functions and operations of a complete system; the weighing controller is to be installed and all functions or operations not simulated during the laboratory evaluation are to be tested under actual field conditions as part of an automatic bulk weighing system.**

32. Performance and Permanence Tests for Automatic Bulk Weighing Systems

Performance tests are conducted to ensure compliance with the tolerance requirements of NIST Handbook 44 and for systems used to weigh grain with additional requirements of the GIPSA.

The tests described here, apply to the entire automatic bulk weighing system, (e.g., the bulk weighing scale controller interfaced with the weigh hopper, load cell(s), material handling system, etc.) ~~**It is assumed that all components of the automatic bulk weighing scale controller have already been examined and found to comply with applicable National Type Evaluation Program requirements.**~~ If the design and performance of the bulk weighing controller is to be determined during the same test, the applicable requirements for automatic bulk weighing systems must be referenced.

…

6. NCWM Publication 14 DES Section 62 Permanence Tests for Scales

Source:
Mr. Darrell Flocken (NCWM/NTEP)

Background:
The wording related to the test load used for the permanence test in Sections 62.1. and 63.6.5. is misleading as to what test load is to be used when conducting this test.

- Section *62.1. Laboratory Permanence Test* states a test load of "one-quarter to one-half scale capacity,…" This can be interpreted as an allowable range and an acceptable test load could be any load between the two values.

- Section *63.6.5. Test Load:* defines absolute test loads determined by the maximum capacity of the device being tested.

  - Section 63.6.5.1. states "For laboratory tests of scales with a capacity of 1000 lb or less, the test load required for the permanence test is 50 % of maximum capacity…"

  - Section 63.6.5.2. states "For laboratory tests of scales with a capacity greater than 1000 lb, the test load required for the permanence test is 250 kg (550 lb),…"

Recommendation:
Modify the statement in Section 62.1. as follows:

> "A laboratory permanence test consists of repeatedly applying to the scale, a test load ~~of one-quarter to one-half scale capacity~~ as defined in Section 63.6.5., simulating normal load application, and periodically conducting normal tests for accuracy."

Conclusion:
The Sector agreed that the wording used to define the test loads used for the permanence test in Sections 62.1. and 63.6.5. is misleading and agreed to amend Section 62.1 as follows:

> **62.1.** Laboratory Permanence Test
> A laboratory permanence test consists of repeatedly applying to the scale, a **test** load **~~of one-quarter to one half scale capacity~~ as defined in Section 63.6.5.,** simulating normal load application, and periodically conducting normal tests for accuracy. Normally, a scale, which…

7. NCWM Publication 14 DES Technical Policy

Source:
Mr. Darrell Flocken (NCWM/NTEP)

Background:
Footnote 2, referenced in paragraph 8.d of the DES Technical Policy and found at the bottom of page DES-6 of the 2015 edition of Publication 14 is misleading. The footnote (repeated below) leads the reader to believe that it is possible to increase the CLC rating of a device that had its Certificate of Conformance issued before October 1998 provided the manufacturer submits evidence of appropriate changes to support the request.

> *[2]For a CC issued prior to October of 1998, the CLC for additional models is allowed to be 5 tons higher than the CLC of the device evaluated, provided evidence is submitted to NTEP that appropriate changes have been made to the weighing/load receiving element to adequately support the increased CLC. If a CC with the additional 5 ton allowance is amended, the 5 ton increased CLC will be retained*

for models already covered by the CC; however, higher CLCs for additional models may not be included without additional testing.

When in fact, this policy allowance was removed from the policy for non-modular vehicle platforms per a decision of the WS during their 1998 Meeting. Attached is an excerpt from the 1998 meeting detailing the decision of the WS members. (Bold and highlights were added to make the appropriate information easy to locate.)

The following was excerpted from the 1998 Weighing Sector Meeting Summary:

Appendix J – Weighing Sector
1998 Meeting Summary
NTEP-63
Meeting Summary
Carry-Over Items

1) Criteria for Modular Scales

Source: NTEP Labs

Background:
At its last meeting, the Weighing Sector agreed to ask the Scale Manufacturers Association's (SMA) Technical Committee to review this item and submit a proposal for changes to Publication 14 relative to modular scales. The Sector specifically asked if SMA could review the current policy for parameters to be covered on a modular scale Certificate of Conformance (CC) based on the model tested. The Sector is asked to consider the resulting proposal developed by the SMA Technical Committee as outlined in Appendix A. The Sector was also asked to review the issue of whether or not a permanence test should be required to expand existing modular scale CCs to include additional capacities and sizes.

Discussion:
Mr. Darrell Flocken (Mettler-Toledo) reviewed the background for the issue and introduced the proposal found in Appendix A. Darrell stated that, although the document has been reviewed by some of the members, the document should not be considered an SMA position because it had not been reviewed by the entire SMA membership. The proposal was presented for consideration on its own merit. The Sector reviewed the basic types of modular scale designs, which were approved at the last meeting. There was general agreement that the intent of the modular criteria was to allow longer scales to be produced by a manufacturer without requiring re-evaluation provided the appropriate load cell parameters were met. There also was discussion of possibly eliminating the lower length limit of 50 % of the shortest module tested. The majority of the Sector favored keeping the lower limit in place.

Conclusion:
The Sector agreed to modify the NTEP Technical Policy for Scales Section B, Part 6, NCWM Publication 14 page 1-11 modular vehicle scale criteria as follows:

6 (a): No change.
6 (b): No change
6 (c): Modify the section as follows:

c. A scale with at least two modules must be tested. The module with the largest CLC is to be tested. Strive to test the module with the longest distance between two sections. If the longest span between sections is not tested, the Certificate of Conformance will include up to 120 percent of the span between sections that was tested. Arrangements regarding the specific scale in the family to be tested will be established in consultation with NTEP representatives.

6 second Part (b): Modify the section as follows:
b. Platform area not less than 50 percent of the smallest two-section (four-cell) module incorporated in the device evaluated to 150 percent of the scale longest module evaluated. Increased platform areas and lengths for scales with

two or more modules are not restricted as long as the width complies with 6(e) and the load cells meet the v_{min} formula; (i.e., v_{min} = d / n). Additional modules to increase length must be of the same type as those used in the device submitted for evaluation (i.e., 4 - cell, 2- cell, 0 - cell.)

6 second Part (c): Modify the section as follows:
c. CLC's complying with the minimum CLC rating (i.e., not less than 80 percent of the capacity of one cell) to 5 tons above device evaluated, but not exceeding twice the capacity of one load cell.

6 second (d) through (h): No change

The Sector also agreed to modify the non-modular vehicle scale criteria as follows:

Part 5(f): Eliminate the 5-ton allowance above the CLC tested as follows:

f. concentrated load capacities (CLC) of 50 percent of the CLC of the device tested to a the maximum of 5 ton higher (for optional higher capacities of devices); however, the manufacturer must provide evidence that the scale with the higher CLC has been structurally strengthened to accommodate the higher loading concentration; in addition the scale that is tested is limited to the CLC rating that applies at the time of the test CLC evaluated; the minimum CLC rating shall not be less than 80 percent of the capacity of one cell but not exceeding twice the capacity of one load cell (the dead load of the weighbridge must be considered);

The Sector discussed eliminating the lower (50 %) restriction on length for non-modular vehicle scales; however, it could not reach a consensus on this proposed change. The Sector also considered making modifications to other non-modular vehicle scale criteria; however, it agreed that it would be better to bring this back as a separate issue for discussion at a future meeting. The Sector agreed that manufacturers can request to have their CCs expanded under the new criteria. The elimination of the five-ton allowance for CLC (under part 5[f] and part 6 second [c]) will not be applied retroactively, but will be applied to new CCs and to requests to modify the CLC beyond that originally listed on the CC.

The Sector discussed a proposal to waive permanence testing on evaluations performed to expand CCs beyond the lengths listed on the original CC. However, in view of changes made by the Sector to expand the criteria, the Sector did not feel that this proposal was still appropriate. Consequently, any testing performed to expand the CC beyond its original platform size or capacity will require a full permanence test.

The outcome of the 1998 discussion was to remove this allowance but to document that the removal will not be applied retroactively meaning the increased CLC value on certificates already modified under this allowance will remain at the modified value. However, the higher CLC allowance will not be applied to new models added to this certificate or to new certificates issued after 1998.

Recommendation:
Remove from the DES, Technical Policy:

1. The reference to footnote 2 in paragraph 8.d.
2. The actual footnote (2) located at the bottom of page DES-6.

Alternatively, revise the wording of footnote 2 to read as follows:

[2] For a CC issued prior to October of 1998, NTEP allowed the CLC value, for additional models, to be increased by 5 tons greater than the CLC of the device evaluated, provided evidence was submitted to NTEP that appropriate changes were made to the weighing/load receiving element to adequately support the increased CLC. This allowance was no longer offered by NTEP for CCs issued after 1998 however, the elimination of this allowance was non-retroactive. CC which were modified per this allowance will remain with the higher CLC value.

This alternate proposal would change the wording of the footnote to eliminate the possible misunderstanding that this allowance is still offered while maintaining the history of the allowance.

Discussion/Conclusion:
Ms. Fran-Elson Houston (Ohio) commented that she had a concern regarding removal of the footnote in its entirety because, by removing it, the history of NTEP allowing the additional five-ton increase in the CLC rating would be lost. She supported replacing the existing footnote with the revised alternative version proposed. Several other Sector members voiced agreement with her concern and supported replacing the existing footnote with the revised alternative footnote. Consequently, the Sector agreed to recommend the existing footnote referenced in paragraph 8.d. of the DES Technical Policy of NCWM Publication 14 be replaced with the following:

> [2] **For a CC issued prior to October of 1998, NTEP allowed the CLC value, for additional models, to be increased by 5 tons greater than the CLC of the device evaluated, provided evidence was submitted to NTEP that appropriate changes were made to the weighing/load receiving element to adequately support the increased CLC. This allowance was no longer offered by NTEP for CCs issued after 1998 however, the elimination of this allowance was non-retroactive. CC which were modified per this allowance will remain with the higher CLC value.**

8. NCWM Publication 14 DES Section 46. Tare Operation – Facilitation of Fraud

Source:
Rick Harshman (NIST OWM) on behalf of the 2015 NTEP Weighing Lab Evaluators

Background:
Representatives from Measurement Canada have identified a possible contradiction in NCWM Publication 14 DES Section 46. Tare Operation - Facilitation of Fraud. This concern was brought to the attention of the NTEP Weighing Labs and discussed at the 2015 NTEP Lab meeting (RE: Weighing Labs Item 4 on the 2015 NTEP Lab Meeting Agenda). The NTEP evaluators were not able to resolve the matter and asked that the WS take up this issue at its 2015 meeting in hopes that it could provide a correct interpretation of the type evaluation criteria.

A description of the concern is as follows:

The following statements appear in subsection 46.2:

46.2. Devices equipped with a tare capability, except for electronic cash registers, are required to provide a clear indication that a tare value has been entered. This indication may be GROSS and NET indications (display modes), or a lighted legend or annunciator such as TARE ENTERED" .... At least one of the following methods must be used to indicate that a tare value has been entered. Indicate which method is used.

46.2.1. A separate continuous display of tare.	☐ Yes	☐ No	☐ N/A
46.2.2. The device has selectable GROSS, TARE, and NET weight display modes with proper descriptors for this information.	☐ Yes	☐ No	☐ N/A
46.2.3. The device has selectable GROSS and NET weight display modes with proper descriptors for this information.	☐ Yes	☐ No	☐ N/A
46.2.4. The display indicates only the net weight and a NET legend or annunciator appears when a tare weight is entered. Gross weight is displayed when the tare weight entry is zero and the NET legend or annunciator is off.	☐ Yes	☐ No	☐ N/A

"TARE ENTERED," although mentioned in the preamble as being an acceptable means of providing a clear indication that tare has been entered, is not one of the options specified in checklist sections 46.2.1. through 46.2.4.

Thus, the preamble uses "TARE ENTERED" as an example of an acceptable means of providing an indication that tare has been taken, whereas, the checklist seems to suggest otherwise.

It was noted during discussion at the 2015 NTEP Lab meeting that the term "net weight" is well defined in NIST handbooks and means the weight of the product alone, whereas, "tare entered" could be interpreted to mean something different (not necessarily that a value being displayed on a scale is the net weight). Canadian representatives reported that Measurement Canada allows a "tare entered" annunciator to be used when the net weight is displayed.

The following meaning of the term "net weight" was copied from the 2015 version of NIST Handbook 130 "Uniform Laws and Regulations in the areas of legal metrology and engine fuel quantity."

Meaning of the term "net weight" copied from 2015 NIST Handbook 130, Uniform Weights and Measures Law

1.8. Net "Mass" or Net "Weight." – The term "net mass" or "net weight" means the weight [***NOTE 1***, page 21] 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.

(Added 1988) (Amended 1989, 1991, and 1993)

Recommendation:
Review DES Section 46.2., including the checklist portions 46.2.1. through 46.2.4. and recommend changes, where appropriate, to better clarify the acceptable means of providing a clear indication that a tare value has been entered, including conditions in which the words "tare entered" might be considered appropriate in defining a net weight indication on a scale.

Technical Advisor's note: Members of OWM's Legal Metrology Devices Program reviewed this WS agenda item and offers the following comments and recommendations:

> The words "tare entered," when defining a value displayed on a scale designed with a single weight display, can be interpreted to mean that the displayed value is the value of a tare that's been entered or that a tare has been entered and the value displayed is a net weight. If a lighted legend or annunciator indicating "tare entered" were used to identify a net weight indication, OWM believes such marking would conflict with NIST HANDBOOK 44 paragraph G-S.6. Marking Operational Controls, Indications, and Features. For this reason, OWM recommends that "tare entered" not be permitted as a means of identifying a net weight indication on a scale. It is OWM's view that the entire second sentence in Section 46.2. can be deleted since 46.2.1. through 46.2.4. provide indication of all the different acceptable ways a scale is able to comply with Section 46.2.
>
> Additionally, OWM finds the language in 46.2.1. ambiguous and suggests it be amended to clarify the meaning of the word "tare." It is not clear from the language if the word "tare" is intended to mean "tare value" or some type of descriptor, such as a tare annunciator? If it is intended that the tare value be continuously displayed and that the value be identified as such, OWM recommends adding additional text to make this clear.

Discussion/Conclusion:
The Sector agreed with OWM's assessment that the words, "tare entered," when used to identify a net weight value being displayed on a scale, *does not* comply with NIST Handbook 44 paragraph G-S.6. Marking Operational Controls, Indications, and Features. During the discussion of this issue, it was noted that a lighted legend or annunciator indicating "tare entered" could be provided to show that a tare had been taken on a scale, but the net weight value displayed would still need to be identified as such in order to comply with paragraph G-S.6.

With respect to OWM's recommendation of amending subsection 46.2.1., the NTEP evaluators participating in the meeting were asked their interpretation of the requirement. The evaluators agreed that the correct interpretation is that there be provided a separate continuous display of the tare *value*.

As the result of these discussions, the Sector agreed to recommend that the second sentence in Section 46.2. be deleted and the word "value" be added to the end of the sentence in subsection 46.2.1. The following represents all the changes agreed to and recommended by the Sector with respect to this item:

46.2. Devices equipped with a tare capability, except for electronic cash registers, are required to provide a clear indication that a tare value has been entered. ~~**This indication may be GROSS and NET indications (display modes), or a lighted legend or annunciator such as TARE ENTERED.**~~ A computing scale shall… At least one of the following methods must be used to indicate that a tare value has been entered. Indicate which method is used.

46.2.1. A separate continuous display of **the** tare **value**. ☐ Yes ☐ No ☐ N/A

…

Following the Sector's decision to delete the second sentence in Section 46.2., Mr. Darrell Flocken (NCWM) noted there may be scales in existence that have been issued a CC that use a "tare entered" legend to identify a net weight indication. He suggested, and the Sector agreed, that a revision date be added at the bottom of Section 46.2. to provide indication of the date of this change.

9. NCWM Publication 14 DES Section73 Performance and Permanence Test Procedures for Dynamic Monorail Scales

Source:
Maryland NTEP Lab

Background:
In Publication 14 Digital Electronic Scales, there is no distinction between testing procedures for Dynamic Monorail Scales and Static Monorail Scales.

Recommendation:
To clarify the NTEP evaluation test procedures for Static Monorail Scales, it is recommended that the following procedures be added to Section 73 of DES Publication:

Procedures to be added to Section 73:

Tests for Static Monorail Scales:

1. Discrimination test at zero-load or near zero-outside the range of the AZT, and at scale capacity or the maximum test load, whichever is less.
2. Increasing and decreasing load test from zero to scales capacity at tolerance break points of 500e, 2000e, 4000e, and 4001+e, load centered on the live rail.
3. A shift test at scale capacity, at maximum used capacity but not less than 1/2 scale capacity. Test loads located at the left, center, and right ends of the scale.
4. Temperature tests, and creep test. Temperature effect on zero.
5. Permanence test cycle of 100 000 weight applications conducted for each model submitted.

Discussion/Conclusion:
The Sector agreed that there exists a gap in NCWM Publication 14 because nowhere within the DES Section are performance and permanence test procedures for static monorail scales explicitly stated. Rather than the Sector taking time during its meeting to develop the performance and permanence test procedures for static monorail scales, Mr. Darrell Flocken (NCWM) offered, and the Sector accepted the offer, to develop a draft of the procedures and distribute them to members of the Sector for an e-mail vote. It was hoped that the procedures could be developed and approved by the Sector's membership in time that they be considered by the NTEP Committee for inclusion into the 2016 version of NCWM Publication 14.

In considering where the procedures for static monorail scales would best fit within the DES Section, it was suggested, and the Sector agreed, that the title of Section 73. be amended and there be two subsections created within; one for dynamic monorail scales, and the other for static monorail scales. The Sector considered two options for changing the Title of Section 73. to make known the inclusion of the additional procedures for static monorail scales as follows:

1. Add the words "Static and" before the word "Dynamic" in the title; or
2. Delete the word "Dynamic" in the title.

Members of the Sector agreed that either option would be acceptable.

10. NCWM Publication 14 DES Section 31 Multi-Interval Scales

Source:
Measurement Canada/Canada

Background:
As part of a routine general maintenance of its documents, Measurement Canada is currently reviewing requirements for multi-interval tare. Because of our mutual recognition agreement, we have to be careful to not change something that could contradict or conflict with NIST Handbook 44 or NCWM Publication 14. In order to avoid this scenario, we need an interpretation of these following sections of that, in our sense, are conflicting.

The preamble to Section 31. contains examples and clauses that conflict with the requirements set out in 31.1. and 31.2. For example, the tare calculation example shows a net weight value that is not consistent with the scale interval of the weighing segment in which it falls, but both 31.1. and 31.2. require that it be consistent. The preamble also states that "Except for semi-automatic tare, all tare values shall not exceed the maximum capacity of the first weighing segment" whereas as 31.1.5. states "Tare may be taken to the maximum capacity of the smallest weighing range (segment) of the scale," leading to another contradiction.

Another issue with Section 31. is the applicability of 31.1. vs 31.2. It seems to be implied that either one or the other applies, depending on how the device operates, but it is not clear. It seems that 31.1. applies to devices that display all three values, while 31.2. is for devices that only display in one mode. However, review of the sub-clauses in each section show this isn't correct (e.g. 31.1.9. refers to scales that only show net weight). We feel that Section 31 needs to be reviewed to consolidate redundant clauses and clearly state the applicability of 31.1. and 31.2.

Recommendation:
The Sector is asked to review NCWM Publication 14, Section 31. for consistency and recommend changes as needed to resolve any conflicts or ambiguous parts.

Discussion/Conclusion:
Mr. Pascal Turgeon (Measurement Canada) identified conflicts in various parts of NCWM Publication 14, DES Section 31. Multi-Interval Scales and suggested some changes based on the type evaluation criteria developed and used by MC in their evaluation of a tare feature on a multi-interval scale. Members of the Sector concluded there are conflicts within Section 31, and it was generally accepted that at least some of the conflicts identified

are the result of grouping together the different requirements that apply to the various types of tare (e.g., semi-automatic, keyboard, etc.) used with multi-interval scales and scales designed with a single versus dual weight display.

Mr. Rick Harshman (NIST Technical Advisor) noted that the tare requirements contained in the Scales Code of NIST Handbook 44 do not provide the same level of detail as those in the NCWM Publication 14 checklist. He noted that members of OWM's Legal Metrology Devices Program believe more work is needed to further develop requirements that apply to tare taken on multi-interval scales. Mr. Darrell Flocken (NCWM) suggested a small work group be formed to further develop the checklist and eliminate the conflicts in Section 31. of NCWM Publication 14 DES. Mr. Harshman suggested a review of the requirements in Section 31. to determine their intended application (e.g., those intended to apply to a scale equipped with semi-automatic tare versus keyboard tare, etc.). He further noted that he believed that much of this work had already been completed by the Sector in previous meetings.

The Sector agreed with Mr. Flocken's suggestion to form a small work group to further develop the checklist and eliminate the inconsistencies that had been identified. The following members of the Sector volunteered to participate on the work group:

Tom Buck (Ohio)
Scott Davidson (Mettler-Toledo)
Paul Lewis (Rice Lake Weighing)
Pascal Turgeon (MC) or (Justin Rae)
Rick Harshman (OWM)

Mr. Harshman agreed to host the first work group tele-conference and it was agreed that the work group would attempt to develop a proposal for the Sector to consider at next year's meeting.

A final recommendation made by Mr. Pascal is to move 31.1.9. and all of its subparts to 31.2. since all of 31.1.9. applies to scales that display or record only net weight values and 31.2. applies to scales that indicate in only one mode (gross or net). This recommendation to be considered by the work group as part of their review and further development of Section 31.

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APPENDIX A
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ATTACHMENTS
TO
AGENDA ITEM 1.C. WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

TENTATIVE CODE APPLICABLE TO WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

A. Application

A.1. General. – This code applies to systems used to weigh vehicles, while in motion, for the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.

A.2. The code does not apply to weighing systems intended for the collection of statistical traffic data.

A.3. Additional Code Requirements. – In addition to the requirements of this code, Weigh-In-Motion Screening Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or a decimal multiple or submultiple of 1, 2, or 5.

Examples: divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Maximum Value of Division Size. – The value of the system division "d" for a Class A, Weight-In-Motion System shall not be greater than 50 kg (100 lb).

S.1.4. Value of Other Units of Measure.

S.1.4.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.4.2. Axle-Spacing (Length). – The center-to-center distance between any two successive axles shall be measured in:

(a) feet and inches;

(b) feet and decimal submultiples of a foot; or

(c) meters and decimal submultiples of a meter.

S.1.4.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.5. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105 % of the specified capacity of the load receiving element.

S.1.6. Identification of a Fault. – Fault conditions shall be presented to the operator in a clear and unambiguous means. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.

(b) The maximum number of vehicle axles as specified has been exceeded.

(b) A change in vehicle speed greater than that specified has been detected.

S.1.7. Recorded Representations.

S.1.7.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) transaction identification number;

(b) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in-motion);

(c) vehicle speed;

(d) number of axles;

(e) weight of each axle;

(f) identification and weight of axles groups;

(g) axle spacing;

(h) total vehicle weight;

(i) all fault conditions that occurred during the weighing of the vehicle;

(j) violations, as identified in paragraph S.2.1., that occurred during the weighing of the vehicle; and

(k) time and date.

S.1.8. Value of the Indicated and Recorded System Division. – The value of the system's division " (d)", as recorded, shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – The instrument shall be capable of accepting user entered violation parameters for the following items:

(a) single axle weight limit;

(b) axle group weight limit;

(c) gross vehicle weight limit; and

(d) bridge formula maximum.

The instrument shall display and or record violation conditions when these parameters have been exceeded.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. –An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load receiving element (or elements) is in use.

S.4. Design of Weighing Devices, Accuracy Class.

S.4.1. Designation of Accuracy. – WIM Systems meeting the requirements of this code shall be designated as accuracy Class A.

Note: This does not preclude higher accuracy classes from being proposed and added to this Code in the future when it can be demonstrated that WIM systems grouped within those accuracy classes can achieve the higher level of accuracy specified for those devices.

S.5. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1.(e)), he system shall be marked with the following information:

(a) Accuracy Class;

(b) Value of the System Division "d";

(c) Operational Temperature Limits;

(d) Number of Instrumented Lanes (not required if only one lane is instrumented.);

(e) Minimum and Maximum Vehicle Speed;

(f) Maximum Number of Axles per Vehicle;

(g) Maximum Change in Vehicle Speed during Weighment; and

(h) Minimum and Maximum Load.

S.5.1. Location of Marking Information. – The marking information required in G-S.1. of the General Code and S.5. shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.5 shall be performed with a minimum of two test vehicles.

(a) The first test vehicle may be a two axle, six tire, single unit truck; that is, a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a maximum Gross Vehicle Weight of 10,000 lbs.

(b) The second test vehicle shall be a five axle, single trailer truck with a maximum Gross Vehicle Weight of 80,000 lbs.

Note: Consideration should be made for testing the systems using vehicles which are typical to the systems daily operation.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale before being used to conduct the dynamic tests.

N.1.1.2. Determining Reference Weights for Axle, Axle Groups and Gross Vehicle Weight. – The reference weights shall be the average weight value of a minimum of three static weighments of all single axle, axle groups and gross vehicle weight.

Note: The axles within an axle group are not considered single axles.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights.

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded to 85 to 95% of their legal maximum Gross Vehicle Weight. The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances.

N.1.3.1. Location of a Reference Scale. – The location of the reference scale must be considered as vehicle weights will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted within 20% below or at the posted speed limit.

N.1.5. Test Procedures.

N.1.5.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test, there will be a minimum of 20 weight readings for each single axle, axle group and gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2.

N.1.5.2. Vehicle Position Test. – During the conduct of the dynamic testing ensure that the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor, 5 runs with the vehicle on the right side along the width of the sensor, and 5 runs with the vehicle on the left side along the width of the sensor. Only gross vehicle

weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3.

N.1.5.3. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of the design principle used.

T.2. Tolerance Values for Accuracy Class A.

T.2.1. To Tests Involving Digital Indications or Representations – To the tolerances that would otherwise be applied in paragraphs T.2.2 and T.2.3, there shall be added an amount equal to one-half the value of the scale division to account for the uncertainty of digital rounding.

T.2.2. Tolerance Values for Dynamic Load Test. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2.

Table T.2.2.
Tolerances for Accuracy Class A

Load Description*	Tolerance as a Percentage of Applied Test Load
Axle Load	± 20 %
Axle Group Load	± 15 %
Gross Vehicle Weight	± 10 %

* No more than 5 % of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.

T.2.3. Tolerance Value for Vehicle Position Test. – The tolerance value applied to each gross vehicle weighment is ±10% of the applied test load.

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 meter (0.5 feet).

T.3. Influence Factors. – The following factor is applicable to tests conducted under controlled conditions only.

T.3.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

T.4. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed the tolerance value as stated in Table T.2.2.

UR. USER REQUIREMENTS

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division and minimum capacity.

UR.1.1. General

The typical class or type of device for particular weighing applications is shown in Table 1. Typical Class or Type of Device for Weighing Applications.

Table 1.
Typical Class or Type of Device for Weighing Applications

Class	Weighing Application
A	Screening and sorting of vehicles based on axle, axle group and gross vehicle weight.
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.

On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

The following are the definitions of terms used in the Weigh-In-Motion Systems used for Vehicle Enforcement Screening – Tentative Code and will appear in NIST HANDBOOK 44 at the end of the code. Once the tentative status is removed from the code, these definitions will then be moved to Appendix D of NIST HANDBOOK 44.

weigh-in-motion (WIM). A process of estimating a moving vehicle's gross weight and the portion of that weight that is carried by each wheel, axle, or axle group, or combination thereof, by measurement and analysis of dynamic vehicle tire forces.

axle. – The axis oriented transversely to the nominal direction of vehicle motion, and extending the full width of the vehicle, about which the wheel(s) at both ends rotate.

axle-group load. – The sum of all tire loads of the wheels on a group of adjacent axles; a portion of the gross-vehicle weight.

axle load. – The sum of all tire loads of the wheels on an axle; a portion of the gross-vehicle weight.

axle spacing. – The distance between the centers of any two axles. When specifying axle spacing, you also need to identify the axles used.

single-axle load. – The load transmitted to the road surface by the tires lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

tandem-axle load. – The load transmitted to the road surface by the tires of two single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

triple-axle load. – The load transmitted to the road surface by the tires of three single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

Weigh-in-Motion Screening Scale. – A WIM system used to identify potentially overweight vehicles.

Wheel weight. – The weight value of any single or set of wheels on one side of a vehicle on a single axle.

WIM System. – A set of sensors and supporting instruments that measure the presence of a moving vehicle and the related dynamic tire forces at specified locations with respect to time; estimate tire loads; calculate speed, axle spacing, vehicle class according to axle arrangement, and other parameters concerning the vehicle; and process, display, store, and transmit this information. This standard applies only to highway vehicles.

NEXT MEETING

There was a recommendation, but no decision made, to hold the 2016 Weighing Sector meeting in Columbus, Ohio. The week of August 21 - 27, 2016, was suggested.

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Appendix G
National Type Evaluation Program (NTEP)
Multiple Dimension Measuring Device Work Group

September 22-23, 2015
Reynoldsburg, Ohio

Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
CC	Certificate of Conformance	NCWM	National Conference on Weights and Measures
HB 44	Handbook 44, "Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices"	NTEP	National Type Evaluation Program
NIST	National Institute of Standards and Technology	OIML	International Organization of Legal Metrology
MDMD	Multiple Dimension Measuring Device	OWM	Office of Weights and Measures
MC	Measurement Canada	R	Recommendation
MRA	Mutual Recognition Arrangement	WG	Work Group

Details of All Items
(In order of Reference)

PRELIMINARIES

i. **Introductions and Welcome *(R. Kennington)***

ii. **Reiteration of NTEP MDMD Work Group Mission *(D. Flocken)***

Discussion:
Mr. Darrell Flocken (NTEP) reviewed the mission of the MDMD WG as stated during the October 2014 and May 2015 WG meeting for the benefit of all participants. The mission of the WG is to deal with specific issues concerning MDMDs, that is, to consider the requirements in NIST Handbook 44 (HB44) and make sure NTEP has a type evaluation checklist in place to verify compliance with HB44 and influence factor testing. NTEP has been asked for years to consider encompassing MDMDs under the United States/Canada Mutual Recognition Arrangement (MRA). At a July 2014 NCWM meeting, Mr. Gilles Vinet (MC) announced Canada wishes to consider including MDMDs under the MRA umbrella with the United States. MC has requested to be lead laboratory. The NCWM Board of Directors is seeking input from the MDMD WG with respect to this issue.

iii. **Goal of this Meeting *(D. Flocken)***

Discussion:
The goal for this meeting is to continue to develop both the MC/NTEP Specification Comparisons document and the update of the NCWM Publication 14 Checklist. In addition, the WG agreed to revisit their current position related to the request to add MDMD instruments to the United States/Canada MRA with MC being defined as the primary evaluation laboratory and the Measurement Canada Laboratory Evaluation Checklist being identified as the primary checklist.

iv. **Report – 2015 NCWM Annual Meeting *(D. Flocken)***

Discussion:
The NCWM 100th Annual Meeting was well attended and went well. No new items dealing with MDMD instruments were presented during the meeting. The one Specifications and Tolerances (S&T) Committee agenda item involving a device that can measure product in the bed of a truck or trailer was Withdrawn from the S&T Committee's agenda in 2014 due to a lack of additional follow-up from the manufacturer and submitter of the item (i.e., LoadScan, Ltd., New Zealand).

v. **Report – Activity of Measurement Canada *(Pascal Turgeon)***

Discussion:
Mr. Pascal Turgeon (MC) reported MC had not received or performed any MDMD evaluations since the WG's May 2015 meeting. Mr. Turgeon reported that MC is still considering the adoption of the OMIL R 129 standard, however, no changes in this activity have occurred since the October 2014 WG meeting.

vi. **Report – Recent NTEP MDMD Type Evaluation Activity *(T. Buck, Ohio NTEP Laboratory)***

Discussion:
It was reported that the Ohio NTEP laboratory had completed three evaluations on measuring devices since the WG's May 2015 meeting. The three evaluations were for amendments to existing certificates.

Carry Over Items

1. Review Meeting Summary from May 2015 Meeting

A copy of the May 2015 Meeting Summary can be downloaded at **www.ncwm.net/ntep/sectors/mdmd/archive**.

2. Review changes to NIST, Handbook 44, MDMD code since last Meeting

No changes to HB44 have been made since the WG's May 2015 meeting.

3. Review changes to NCWM, Publication 14, MDMD Checklist

No changes to Publication 14, MDMD Checklist have been made other than those agreed to during the WG's May 2015 meeting. See Item 6 for more details.

4. Review changes to Measurement Canada MDMD Code and Terms and Conditions

Mr. Pascal Turgeon (MC) reported that there were no changes to these documents since the WG's May 2015 meeting.

5. Review update to NTEP/MC Requirements Comparison Document

Discussion:
Darrell Flocken (NTEP) reported that he and Mr. Turgeon (MC) worked together after the May 2015 meeting to update the MC reference numbers in the document. Mr. Turgeon confirmed the update but reported that some of the notes in the document were missed. Mr. Turgeon provided a copy of the documents with the location of the incorrect reference numbers. The document was reviewed for additional changes/updates based on the members' agreement to the additions to the MDMD NCWM Publication 14 Checklist.

Recommendation:
Darrell Flocken agreed to correct the references to the MC documents and to update the Pub 14 column to add the proper section reference number. A copy of the updated document will be distributed with the meeting summary.

6. Review update to new draft revision of Publication 14, MDMD Checklist

Discussion:
During the May 2015 WG meeting, several proposed changes to the draft were discussed and agreed to by the WG. Members of the WG reviewed these changes for accuracy. During the review, the following items were discussed.

1. Section D in the Technical Policy contained the definitions of the terms "Longitudinal" and "Transverse." The members reviewed these definitions, which were copied from MC documentation. The discussions led to the recommendation that the second sentence in both definitions be removed and that the term "Vertical" and its definition be added.

2. It was pointed out that the "Amendments" list at the beginning of the document was missing some changes that were made during previous meeting. Mr. Darrell Flocken (NTEP) agreed to review all changes and correct the list.

3. During the review of the new test condition examples in the "Touching Objects Test," several members voiced their confusion on a few of the examples as there seemed to be a few duplicates. Mr. Pascal Turgeon (MC) contacted the MC Laboratory and learned that there was an error in line 8 of the test sequence. The error was corrected.

4. A few editorial changes were suggested and made.

Recommendation:
The members agreed that after completing the changes mentioned above, the document will be ready to submit to the NTEP Committee for adoption and inclusion into the 2016 edition of NCWM Publication 14. Mr. Flocken agreed to make the changes and e-mail the revised document to the members for a review and explained that there is a November 1st deadline to submit the document or there will be an additional one year delay getting it published.

7. Review Results of the NTEP/MC Mutual Recognition Agreement Discussion at the 2015 NCWM Annual Meeting

Discussion:
Mr. Jim Truex (NTEP Administrator) was present and opened this discussion. Mr. Truex provided background information on how the NTEP Committee reached their recommendation during the NCWM Annual Meeting in July.

After his comments, Mr. Truex left the meeting and the members continued their discussion on this matter. Refer to Items 7.a. and 7.b. for the specifics of the discussion.

a. Recommendation for the MC Checklist to be Primary Evaluation Document

Discussion:
During their May 2015 meeting, the WG recommended to the NCWM Board of Directors that the MC checklist not be the primary document for the evaluation of MDMDs and that each country adopt its own checklist.

As reported by Mr. Truex, the NCWM NTEP Committee accepted this recommendation and recommended that the WG continue updating the current evaluation checklist in NCWM, Publication 14. Refer to Item 6 of this meeting summary for the current status of the checklist update.

b. Recommendation for MC to be Primary Evaluation Laboratory

Discussion:
At the suggestion of Mr. Jim Truex (NTEP Administrator), the WG revisited this item to consider its current position.

The members of the Work Group again voiced their concern regarding the impact of this recommendation on the current work load of the Ohio NTEP Laboratory, the potential loss of expertise in MDMD evaluations, and the time it takes to obtain a certificate through the MC lab due to a backlog of evaluations and customs issues. Mr. Pascal Turgeon (MC) commented on the items by reporting that MC will send the test data to NTEP within a few days of the completion of the actual evaluation. This will allow NTEP to issue an NTEP CC while the test data is also being reviewed and processed by MC personnel. Mr. Turgeon also stated, it is clear that at some time in the future, the exclusiveness of the MC Laboratory could be removed. He also reminded everyone that the device type (i.e., MDMDs) could be removed from the MRA at any time.

The WG continued the discussion and agreed to revise its current position. The revised recommendation/position of the WG is provided below. Once the revised position was drafted and reviewed by all members, the chairman asked if any member disagreed; the Ohio NTEP Laboratory voiced their disagreement. No other objection was heard and the recommendation was made to forward the revised position to the NCWM NTEP Committee. A copy of the recommendation was sent to Mr. Truex on September 23rd so that it could be presented at the NCWM Board of Directors' Fall Meeting the following week.

Recommendation:
The WG agrees to adding MDMD devices to the MRA and assign MC as the primary evaluation laboratory providing:

1. Separate evaluation checklists are used and maintained by NTEP and MC Laboratories.

2. A specification comparison document is maintained which identifies differences in specifications that require separate testing.

3. A commitment of the NTEP and MC labs to work together to reach a position where test data can be shared in both directions, eliminating the need for there to be a primary laboratory, thus supporting the existing wording in Section 4 of the current MRA. For example:

   a. Test Standards and Equipment

   b. Checklist Specific Training (Knowledge of country specific requirements.)

   c. A goal of reaching this objective by the 2021 renewal of the MRA.

4. A request that NTEP and MC review internal processes with the goal of a quick turnaround of test results and reducing the overall time between application and certificate issuance.

8. Report on Progress from Multi-Interval Operation Requirements Subgroup

Discussion:
The members of the WG heard from Mr. Richard Harshman (NIST, OWM) that an NCWM Form 15 proposal was submitted to the NCWM on behalf of the WG for consideration by the four regional weights measures associations during their fall 2015 meetings. The proposal, drafted as agreed by the WG at their May 2015 meeting, recommends changes to the HB44 MDMD Code to address the use of multi-intervals in two or more partial measuring ranges within the same axis of an MDMD. Mr. Harshman noted that the proposal was submitted in time that all four regional associations should consider it during their fall 2015 meetings and with the recommendation that it be a Voting item.

9. Develop Form 15s Identified in Requirements Comparison Document

Discussion:
The WG developed an NCWM Form 15 proposal for submittal to the NCWM for consideration by the regional weights and measures associations during their fall 2015 meetings. The proposal recommends a change to the MDMD Code of HB44 to include the requirement that all axes have the same unit of measure.

NEW ITEMS

Two new items were introduced during the meeting.

1. Mr. Kennington (WG Chair) led a discussion on whether or not the WG should request to be reassigned as an NTEP Sector. Mr. Flocken explained that the only difference between a WG and a Sector is that for a Sector the travel expenses for one evaluator from each authorized laboratory are paid for by NTEP. However, since the Ohio Laboratory is the only NTEP authorized laboratory to perform evaluations on MDMD devices and all recent WG Meeting have been held at the Ohio Laboratory, there is no increased benefit of becoming an NTEP Sector. Mr. Kennington recommended that the group not request reassignment and remain as a WG.

2. A proposal was presented to allow additional locations for some MDMD marking requirements. This request is due to smaller-sized devices. The members agreed, and a NCWM Form 15 was developed by the WG and will be submitted to the NCWM for consideration by the various regional weights and measures associations when they meet in the fall of 2015.

3. A suggestion was made that a letter stating the WG's position on the addition of the MDMD devices to the United States/Canada MRA be drafted by Mr. Kennington and distributed to the WG via e-mail by December 1, 2015. A conference call is to be scheduled in December 2015 to review the contents of the letter and determine if the letter is to come from the WG representing all member companies or to be submitted by each member company individually. The letter will be addressed to the members of the NTEP Committee. In addition, during the call the members will coordinate attendance to the January 2016 NCWM Interim Meeting to show support for the WG position. The WG discussed the possibility of asking the SMA to develop a statement supporting the position. Mr. Russ Vires (Mettler Toledo) mentioned that he would be attending the SMA's November meeting and would make this suggestion. Based on Mr. Vires comment, the WG decided to not make a formal request to the SMA.

CLOSING DISCUSSION

10. Review Meeting Activities and Conclusions

11. Define Next Steps (if needed)

12. Next Meeting

Members of the WG discussed meeting frequency and agreed that due to the MRA activity, they would meet again in approximately six months, on April 26 - 27, 2016, at the Ohio NTEP Laboratory. It is felt that at the conclusion of the April 2016 meeting, the meeting frequency would be changed to an annual time frame.

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Report of the Nominating Committee

Ron Hayes, Committee Chair
Missouri

800 INTRODUCTION

The Nominating Committee (hereinafter referred to as the "Committee") met during the Interim Meeting of the National Conference on Weights and Measures (NCWM) Interim Meeting, January 10 - 16, 2016, in San Diego, California. At that time, the Committee nominated persons for the various available Board of Director positions for the 101st NCWM. The following report reflects the decisions of the NCWM membership.

Table A identifies the agenda items by reference key, title of item, page number and the appendices by appendix designations, and Table B reflects the Voting Results.

Table A
Table of Contents

Table B
Voting Results

Reference Key Number	House of State Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
To Elect the Slate of Officers as presented in the Report	Voice Vote				Adopted

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Details of All Items
(In order by Reference Key)

810 NOMINATIONS

(This item was adopted by unanimous vote of the 101st National Conference on Weights and Measures)

810-1 V Officer Nominations

Source:
Nominating Committee

Purpose:
Election of NCWM officers

Item Under Consideration:
The following slate of officers was selected by unanimous vote of the committee:

Chairman-Elect:
James Cassidy, City of Cambridge, Massachusetts Weights and Measures Department

Treasurer: (1 year)
Raymond Johnson, New Mexico Department of Agriculture

Board of Directors Associate Membership Director: (3 years)
Christopher Guay, Procter and Gamble Co.

Board of Directors At-Large: (5 years)
Julie Quinn, Minnesota Department of Commerce

Background/Discussion:
The Nominating Committee met during the 2016 Interim Meeting at the Westin San Diego Gaslamp Quarter Hotel in San Diego, California, at which time the Committee nominated the persons listed above to be officers of the 102nd National Conference on Weights and Measures. In the selection of nominees from the active and associate membership, consideration was given to professional experience, qualifications of individuals, conference attendance, participation, and other factors considered to be important.

Mr. Ron Hayes, Missouri | Committee Chair
Mr. Stephen Benjamin, North Carolina | Member
Mr. Charles Carroll, Massachusetts | Member
Mr. Kurt Floren, Los Angeles County, California | Member
Mr. John Gaccione, Westchester County, New York, | Member
Mr. Joe Gomez, New Mexico | Member
Mr. Randy Jennings, Tennessee | Member

Nominating Committee

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