



United States Department of Commerce  
Technology Administration  
National Institute of Standards and Technology

## **NIST SPECIAL PUBLICATION 870**

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# **Report of the 79th National Conference on Weights and Measures**

**1994**



**as adopted by the 79th National Conference  
on Weights and Measures 1994**



**Report of the  
79th National Conference on  
Weights and Measures**

*Sponsored by the National Institute of Standards and Technology*

*Attended by Officials from the Various States, Counties, and Cities, and  
Representatives from U.S. Government, Industry, and Consumer Organizations*

**San Diego, California July 17-21, 1994**

Report Editors:           Caroll S. Brickenkamp, Ph.D.  
                                  Ann H. Turner



*U.S. Department of Commerce*  
Ronald H. Brown, Secretary

*Technology Administration*  
Mary L. Good, Under Secretary for Technology

*National Institute of Standards and Technology*  
Arati Prabhakar, Director

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## **Abstract**

The 79th Annual Meeting of the National Conference on Weights and Measures (NCWM) was held July 17 through 21, 1994, at the Doubletree Hotel at Horton Plaza, San Diego, California. The theme of the meeting was "Consensus Through Communication."

Reports by the standing and annual committees of the Conference comprise 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 Metrologists, the Associate Membership Committee, the Retired Officials Committee, the Scale Manufacturers' Association, the American Petroleum Institute, the Industry Committee on Packaging and Labeling, the regional weights and measures associations, and the National Association of State Departments of Agriculture Weights and Measures Division, and the National Council on State Metrication.

Key words: grain moisture; legal metrology; mass-flow meters; motor-fuel dispensers; safety; scales; specifications and tolerances; training; type evaluation; uniform laws and regulations; weights and measures.

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**Note:** The policy of the National Institute of Standards and Technology is to use metric units of measurement in all of 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 inch-pound units. 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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James C. Truex, Acting Chief, Weights and Measures, Ohio Department of Agriculture	
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## Past Chairmen of the Conference

CONFERENCE	YEAR	CHAIRMAN
43rd	1958	J. P. McBride, MA
44th	1959	C. M. Fuller, CA
45th	1960	H. E. Crawford, FL
46th	1961	R. E. Meek, IN
47th	1962	Robert Williams, NY
48th	1963	C. H. Stender, SC
49th	1964	D. M. Turnbull, WA
50th	1965	V. D. Campbell, OH
51st	1966	J. F. True, KS
52nd	1967	J. E. Bowen, MA
53rd	1968	C. C. Morgan, IN
54th	1969	S. H. Christie, NJ
55th	1970	R. W. Searles, OH
56th	1971	M. Jennings, TN
57th	1972	E. H. Black, CA
58th	1973	George L. Johnson, KY
59th	1974	John H. Lewis, WA
60th	1975	Sydney D. Andrews, FL
61st	1976	Richard Thompson, MD
62nd	1977	Earl Prideaux, CO
63rd	1978	James F. Lyles, VA
64th	1979	Kendrick J. Simila, OR
65th	1980	Charles H. Vincent, TX
66th	1981	Edward H. Stadlnik, MA
67th	1982	Edward C. Heffron, MI
68th	1983	Charles H. Greene, NM
69th	1984	Sam F. Hindsman, AR
70th	1985	Ezio F. Delfino, CA
71st	1986	George E. Mattimoe, HI
72nd	1987	Frank Nagele, MI
73rd	1988	Darrell A. Guensler, CA
74th	1989	John J. Bartfai, NY
75th	1990	Fred A. Gerk, NM
76th	1991	N. David Smith, NC
77th	1992	Sidney A. Colbrook, IL
78th	1993	Allan M. Nelson, CT

## State Representatives

The following designated State Representatives were present and voted on reports presented by the Conference standing and annual committees.

State	Representative	Alternate
Alabama	Charles A. Burns, Jr.	None
Alaska	Aves D. Thompson	None
American Samoa	Silimusa Solomona	None
Arizona	Sharon Rhoades	None
Arkansas	James M. Hile	None
California	Darrell A. Guensler	Barbara J. Bloch
Colorado	David R. Wallace	None
Connecticut	Allan M. Nelson	Michael Dynia
Delaware	William Lagemann	None
District of Columbia	None	None
Florida	Max Gray	Jack Jeffries
Georgia	Curt Williams	Jim Wilson
Guam	None	None
Hawaii	None	None
Idaho	Glen H. Jex	None
Illinois	Sidney A. Colbrook	Richard Philmon
Indiana	Doyle D. Bell	Charles f. Critzer
Iowa	Jerry Bane	None
Kansas	DeVern H. Phillips	None
Kentucky	Vicki Searcy	Danny Willis
Louisiana	None	None
Maine	Clayton F. Davis	Stanley K. Millay
Maryland	Louis Straub	Constantine Cotsoradis
Massachusetts	Charles H. Carroll	None
Michigan	Edward C. Heffron	Celeste Bennett
Minnesota	Bruce Adams	Mark V. Buccelli

State	Representative	Alternate
Mississippi	William P. Eldridge	John Tillson
Missouri	Roy Humphreys	Dwain Snider
Montana	None	None
Nebraska	Steve Malone	Richard Suiter
Nevada	None	None
New Hampshire	Michael F. Grenier	None
New Jersey	Herbert Sehgel	None
New Mexico	Gary D. West	None
New York	John J. Bartfai	None
North Carolina	N. David Smith	Ronald D. Murdock
North Dakota	Michael S. Pinagel	None
Ohio	Jim Truex	Barbara DeSalvo
Oklahoma	Charles Carter	None
Oregon	Ken Simila	None
Pennsylvania	Dean F. Ely	A. Courtney Yelle
Puerto Rico	Edmundo Rosario Fred	None
Rhode Island	None	None
South Carolina	Carol P. Fulmer	None
South Dakota	Don Walz	None
Tennessee	Robert G. Williams	Cathryn F. Pittman
Texas	Edwin J. Price	James H. Eskew
Utah	David McKay	None
Vermont	Bruce Martell	None
Virginia	J. Alan Rogers	G. West Diggs
Virgin Islands	Louis Penn	Luis F. Santos
Washington	Robert D. Arrington	None
West Virginia	Karl Angell, Jr.	None
Wisconsin	Alan Porter	James Akey
Wyoming	Victor Gerber	None

### **Executive Committee and NTEP Board of Governors (BoG)**

Chairman: T. Geiler, Barnstable, MA  
Chairman-Elect: J. Truex, OH  
Past Chair/BoG: A. Nelson, CT  
Treasurer: C. Gardner, Suffolk Co., NY  
Members: D. Guensler, CA (1)  
S. Malone, NE (1)  
J. A. Rogers, VA (2)  
A. Thompson, AK (3)  
C. Fulmer, SC (3)

President: A. Prabhakar, NIST Director  
Executive Secretary: C. Brickenkamp, NIST Office of Weights and Measures  
Technical Advisor: R. Bruce, Canada, (Exec. Committee only)

Weights and Measures Coordinator:  
A. Turner, NIST

**See Working Groups and Annual Committees to the Executive Committee after the Standing Committees.**

#### **Laws & Regulations Committee**

Chairman: B. Bloch, CA (1)  
Members: R. Gunja, Kansas City, KS (5)  
S. Millay, ME (4)  
S. Rhoades, AZ (2)  
L. Straub, MD (3)

Technical Advisors:  
K. Butcher, NIST  
G. Coleman, MD/NIST  
G. Jorowski, Canada  
G. Vinet, Canada

#### **Petroleum Subcommittee**

Chair: C. Bennett, MI  
Technical Advisors:  
C. Brickenkamp, NIST  
E. Hamilton, FL

#### **NIST Handbook 133 Working Group**

Chairman: B. Bloch, CA  
Technical Advisors:  
K. Butcher, NIST  
C. Brickenkamp, NIST

#### **SI Working Group**

Chair: E. Heffron, MI  
Technical Advisor:  
K. Butcher, NIST

#### **Specifications & Tolerances Committee**

Chairman: J. Jeffries, FL (1)  
Members: R. Kelley, NYC, NY (4)  
R. Murdock, NC, (5)  
R. Suiter, NE (2)  
G. West, NM (3)

Technical Advisors:  
T. Butcher, NIST  
R. Marceau, Canada  
H. Oppermann, NIST

#### **Solid Volume Measuring Devices Working Group**

Chair: C. Skonberg, United Parcel Service  
Technical Advisor:  
N. Dupuis-Desormeaux, Canada

<p><b>Education, Administration, &amp; Consumer Affairs Committee</b></p> <p>Chairman: J. Harnett, Orange Co, CA (1)</p> <p>Members: B. DeSalvo, OH (3) M. Gray, FL (2) B. Martell, VT (5) E. Price, TX (4)</p> <p>Technical Advisor: J. Koenig, NIST</p> <p><b>NCWM Safety Liaison:</b> C. Gardner, Suffolk Co, NY</p>	<p><b>Liaison Committee</b></p> <p>Constitution and Bylaws to be amended to delete this committee. NCWM voting membership accepted Executive Committee's proposal to operate Conference as if this change to Constitution and Bylaws had already been made. No appointments have been made to this committee.</p>
<p><b>Privatization Work Group</b></p> <p>Chairman: A. Nelson, CT</p> <p>Members: S. Colbrook, IL J. Colman, FMI T. Geiler, Barnstable, MA D. Guensler, CA R. Hutton, Winn-Dixie C. Kloos, Hunt-Wesson N. D. Smith, NC T. Stabler, Mettler-Toledo D. Tonini, SMA R. Tucker, Tokheim</p> <p>Technical Advisor: C. Brickenkamp, NIST</p>	<p><b>U.S.-Canada Mutual Recognition Working Group</b></p> <p>R. Andersen, NY C. Brickenkamp, NIST R. Bruce, Canada T. Butcher, NIST S. Colbrook, IL C. Cotsoradis, MD T. Geiler, Barnstable, MA A. Nelson, CT H. Oppermann, NIST</p>
<p><b>ISO 9000 Task Force</b></p> <p>Public Sector Members: D. Dikken, MN M. Dynia, CT L. F. Eason, NC K. Fraley, OK S. McGuire, IL K. Moody, AZ</p> <p>Private Sector Members: R. Calkins, Rice Lake Weighing Systems J. Everhart, EG&amp;G Mound Applied Technologies M. Kline, Troemner, Inc. R. Weber, 3M</p> <p>Technical Advisor: Georgia Harris, NIST</p>	<p><b>Nominating Committee</b></p> <p>Chairman: A. Nelson, CT</p> <p>Members: S. Colbrook, IL C. Gardner, Suffolk Co., NY M. Gray, FL S. Rhoades, AZ G. Shefcheck, OR N. David Smith, NC</p>
<p><b>Budget Review Committee</b></p> <p>Chairman: T. Geiler, Barnstable, MA</p> <p>Members: H. Lodge, Dunbar (2) N. David Smith, NC (2) S. Colbrook, IL (1) C. Gardner, Suffolk Co., NY C. Brickenkamp, NIST</p>	<p><b>Auditing Committee</b></p> <p>Chairman: R. Gunja, Kansas City, KS (1)</p> <p>Members: J. H. Eskew, TX (2) R. Kalentkowski, CT (3)</p> <p>Coordinator: J. Mindte, NIST</p>



<p><b>Credentials Committee</b></p> <p>Chairman: R. Greek, San Luis Obispo, CA (1)</p> <p>Members: D. Ely, PA (2) P. Nichols, Alameda Co., CA</p> <p>Coordinator: J. Mindte, NIST</p>	<p><b>Resolutions Committee</b></p> <p>Chairman: B. Martell, VT (2)</p> <p>Members: C. Fulmer, SC (2) W. Lagemann, DE (2) R. Philmon, IL (2) J. Silvestro, Gloucester Co., NJ (1)</p> <p>Coordinator: J. Mindte, NIST</p>
<p><b>Other Appointed Officers</b></p> <p>Parliamentarian: K. Simila, OR</p> <p>Chaplain: W. Lagemann, DE</p> <p>Assistant Treasurer: F. Clem, Columbus, OH</p> <p>Sergeants-At-Arms: R. Keadle, Monterey Co., CA W. Korth, Ventura Co., CA</p>	<p><b>Other Elected Officers</b></p> <p>Vice Chairmen: C. Davis, ME K. Fraley, OK M. Hopper, Kern County, CA A. Porter, WI</p>
<p><b>Associate Membership Committee</b></p> <p>Chairman: C. Guay, Procter &amp; Gamble</p> <p>Vice Chair: T. James, Cardinal Detecto</p> <p>Secretary: W. Corey, American Frozen Foods</p> <p>Treasurer: T. Stabler, Mettler-Toledo</p> <p>Members: I. Bell, Coca-Cola Company W. Braun, WHBraun Resources J. Colman, FMI R. Davis, James River Corp. C. Kloos, Hunt-Wesson Foods</p>	



## National Type Evaluation Program

### Technical Committee

Chair: J. Elengo, Jr.

#### Weighing Sector

Chair: J. Elengo, Jr.

Technical Advisor:  
T. Butcher, NIST

Public Members:  
R. Andersen, NY  
C. Bertrand, Canada  
C. Cotsoradis, MD  
G. W. Diggs, VA  
D. Guensler, CA  
P. Peterson, USDA-P&SA  
R. Pforr, USDA-FGIS  
H. Oppermann, NIST  
J. Truex, OH  
O. Warnlof, NIST  
K. Yee, NIST

Private Sector Members:  
M. Adams, Fairbanks Scales  
J. Antkowiak, Hottinger Baldwin  
Msmts.  
W. Goodpaster, Cardinal/Detecto  
K. Haker, BLH Electronics  
T. Johnson, Sensortronics  
D. Krueger, NCR Corp.  
G. Lameris, PMI Food Equipment  
H. Lockery, Lockery Assoc.  
J. MacDonald, Chronos  
Richardson  
J. Reimer, Weigh-Tronix  
J. Robinson, Assoc. of American  
Railroads  
T. Stabler, Mettler-Toledo, Inc.  
D. Tonini, Scale Manufacturers  
Assoc.  
J. Wang, A&D Engineering, Inc.

#### Automatic Weighing Systems Working Group

Chair: D. Johannes, CA

Technical Advisor:  
K. Butcher, NIST

#### Class IIIL Working Group

Chair: W. T. James, Cardinal Detecto

#### Measuring Sector

Chair: N. Alston, Daniel Flow Products,  
Inc.

Technical Advisor:  
T. Butcher, NIST

Public Sector Members:  
R. Andersen, NY  
C. Cotsoradis, MD  
D. Guensler, CA  
J. Jeffries, FL  
S. Malone, NE  
D. Morgan, Canada  
R. Murdock, NC  
H. Oppermann, NIST  
J. Truex, OH  
O. Warnlof, NIST

Private Sector Members:  
F. M. Belue, Belue Associates  
R. Fonger, Bennett Pump  
M. Hankel, Liquid Controls  
F. Holland, Schlumberger  
Technologies  
R. Huff, Universal Epsco  
D. Joines, Dresser Wayne  
G. Johnson, Gilbarco  
M. Keilty, Micro Motion, Inc.  
D. Krueger, NCR Corp.  
S. Retrum, Shell Oil Co./API  
T. Scott, Brooks Instrument Co.  
J. Skuce, Smith Meter, Inc.  
D. Smith, William M. Wilson's  
Sons  
R. Tucker, Tokheim Corp.

### **Belt Conveyor Scales Sector**

Chair: N. Johnson, Merrick Corp.

Technical Advisor:  
R. Whipple, NIST

Public Members:  
C. Bertrand, Canada  
C. Cotsoradis, MD  
R. Miller, CO  
H. Oppermann, NIST  
O. Warnlof, NIST

Private Sector Members:  
W. Brasher, Southern Co.  
Services  
G. Burger, Consultant  
M. Casanova, Ramsey  
Technology  
P. Chase, Envirotech  
D. Cockrell, Consultant  
R. Dietrich, Kaskaskia Valley  
Scale  
R. DeSollar, Central IL Pub.  
Service  
S. Hawkins, ABC Scale  
T. Johnson, Sensortronics  
K. Knapp, Milltronics  
F. Joe Loyd, CSX Transportation  
J. MacFarlane, CST Auto Weigh  
J. Oliver, Virginia Power  
N. Ortyl, III, Dresser Industries  
R. Penner, Riede Systems  
J. Robinson, Assoc. of American  
Railroads  
P. Sanford, Thayer Scale  
D. Tonini, Scale Manufacturers  
Assoc.

### **Grain Moisture Meter Sector and Near Infrared Protein Analyzer Sector**

Chair: L. Hill, Univ. of Illinois

Technical Advisor:  
R. Pierce, USDA-FGIS

Public Members:  
Canadian Grain Commission  
R. Burns, AR  
T. Butcher, NIST  
D. Funk, USDA-FGIS  
D. Onwiler, NE  
H. Oppermann, NIST  
J. Rothleder, CA  
C. Tew, NC  
R. Wittenberger, MO  
R. Wotthlie, MD

Private Sector Members:  
J. Bair, Millers Nat'l Federation  
J. W. Barber, Dickey-John  
A. Butler, Perten Instruments  
M. Emori, Kett Electric  
Laboratory\*  
C. Hurburgh, Jr., IA State Univ.  
D. Kaminsky, Trebor  
J. McClenethan, Growmark, Inc.  
M. Hall, Sartorius Instruments  
T. O'Connor, Nat'l Grain & Feed  
Assoc.  
A. Pflug, CSC Scientific\*  
T. Runyon, Seedboro Equipment  
F. Seeber, Shore Sales Co., Grain  
Elevator & Processors Soc.  
C. Watson, Stein Labs, Perstorp  
Analytical, Foss Foods

\*(Grain Moisture Meter Sector only)

## **President's Address**

Dr. Peter L. M. Heydemann, Director of Technology Services, National Institute of Standards and Technology (NIST), addressed the Conference July 19, 1994, and represented the NIST Director, Dr. Prabhakar, who is also President of the National Conference on Weights and Measures, presenting all the honor awards. His speech was not recorded, and was extemporaneous. His slides are reprinted below since they are self explanatory. His speech focused on the role of the National Conference on Weights and Measures as an important partner for NIST in its effort to support U.S. industry and trade. His parting words were "Remember that America is what we make it."

## **The Institute & The Conference**

**Our Roles & Future Together**

## **National Institute of Standards and Technology**

- Administration's Lead Technology Agency
- Priorities to the President, Vice President, and NIST Director:
  - Advanced Technology Program
  - Manufacturing Extension Program
    - to build an extramural infrastructure for our businesses and industry

## **National Institute of Standards and Technology**

- Program Growth in "Outreach" areas - Manufacturing Technology Centers; Advanced Technology Program (FY 94)
  - 194% increase
  - from \$67.9 m in FY 93 to \$199.5 m in FY 94
- Manufacturing Extension Program
  - from \$16.9 m in FY 93 to \$30.2 m in FY 94
- Laboratory Program Increase of 17%
  - from \$192.9 m in FY 93 to \$226 m in FY 94

## **National Institute of Standards & Technology**

- New Director: Arati Prabhakar (May 1993)
- New Director, Technology Services, Peter Heydemann (October 1993)
- New Director, Office of Standards Services, Belinda Collins (May 1994)
- Planned reassignment of the Office of Weights and Measures to the Office of Measurement Services, Stan Rasberry (not yet completed)
- Planned growth of the Office of Weights and Measures
  - Hiring 3 (4?) more technical professionals

## **Weights and Measures Program**

- Original NIST Extramural Infrastructure Support Program
  - Traceable transfer from NIST standards of mass, length, volume, and temperature to State Weights and Measures Laboratories
  - Sponsorship of legal metrology standards development process
    - the National Conference on Weights and Measures
    - the National Type Evaluation Program
    - the National Training Program

## **Office of Weights and Measures**

- manages State Laboratory Program
  - remodeled demonstration and training laboratory at NIST
  - building user-operated mass calibration packages for surveillance
  - planning a new state-of-the-art demonstration and training laboratory
  - basis for establishing a training academy in metrology and related areas at NIST

## **Priorities for the NCWM**

- State Weights and Measures Laboratories
  - Maintain accreditation as State Legal Metrology Laboratories and request accreditation as Calibration Laboratories by the National Voluntary Laboratory Accreditation Program (NVLAP)
- Why?
  - Mutual recognition of your calibration services by other nations - ISO Guide 25 (ISO 9000)
  - Recognizes your role as technology transfer assistants to your businesses and industries

## **Office of Weights and Measures**

- Sponsors the National Conference on Weights and Measures
  - OWM is only one of three partners:
  - Other partners:
    - Federal, State, local weights and measures agencies
    - businesses and industry

## **Industry Is Our Driving Force**

- private business drives our economic engine
- the U.S. must compete in a global marketplace
- What does private business need to compete globally?



## **NIST responds by:**

- providing measurement services, data, and reference materials to industry
- supporting the NCWM
- working with industry in the Advanced Technology Program (ATP)
- supporting small and midsize companies with the Manufacturing Extension Program (MEP)
- assisting industry with actions to overcome non-tariff trade barriers and with standards information
- providing a broad range of training opportunities

## **At NIST:**

- What do we need to know about measurement technologies for the future?
  - electronic realization of the kilogram (mass)
  - diode lasers for dimensional metrology
  - quantum physics realization of the volt, ohm, and ampere
  - traceability of the mole (amount of substance)



## **Priorities of the NCWM**

- Establish a national/NAFTA legal metrology information hub on the "information highway"
- Think UNITY
  - not States vs. Federal government
  - not government vs. business
  - not national vs. international
- Form partnerships

## **Within the NCWM:**

- What does private business need to compete globally?
  - impact of standards on competitiveness
- What standards do we need to prepare for measurement technologies for the future?
  - automatic weighing technologies
  - compressed natural gas as an alternative fuel
  - multidimensional measuring devices for the shipping industry
  - retail scanners & computer price look-ups

## **Office of Weights and Measures**

- manages National Type Evaluation Program
  - partnering with Canada's Legal Metrology Branch
  - coordinating Participating Laboratories
  - providing technical advisors for Technical Committee Sectors

## **Priorities for the NCWM**

- NTEP must provide OIML Certificates for our businesses to use to penetrate other markets on other continents
  - NTEP Participating Laboratories and Canada and Mexico can move together to make NAFTA a reality in legal metrology area
  - NIST is investigating equipping one NTEP laboratory to perform entire set of OIML tests

## Honor Award Presentations

### 10 Years

Barbara Bloch  
Marilyn Herman  
Robert Brumbaugh  
Richard Weber

### 20 Years

Sidney Colbrook  
A. R. Daniels  
Harvey Lodge

### 25 Years

Joseph Silvestro  
Ken Simila

### 30 years

Otto Warnlof

## Special Recognition Awards

The success of this Conference is the result of the dedication and hard work of many individual members. The work of the members is not complete until the official closing of the 79th Annual Meeting on Thursday. However, we would like to recognize them now at the General Session for their contributions over the past years within their respective committees and for their contributions to the National Conference in general.

## Standing Committees

### Executive Committee

Darrell Guensler, State of California  
Steven Malone, State of Nebraska

### Laws and Regulations Committee

Barbara Bloch, State of California

### Specifications and Tolerances Committee

Jack Jeffries, State of Florida

### Education, Administration, and Consumer Affairs Committee

James Harnett, Orange County, California

### Vice-Chairmen

Clayton Davis, State of Maine  
Ken Fraley, State of Oklahoma  
Monty Hopper, Kern County, California  
Allan Porter, State of Wisconsin

### Sergeants-At-Arms

Robert Keadle, Monterey County, California  
William Korth, Ventura County, California

**Associate Membership Committee**

Chris Guay, Procter & Gamble

**Annual Committees**

We will now recognize those members who work hard to insure that all of our business is accomplished smoothly and efficiently at these interim and annual meetings; They are the members of the various annual committees who are completing their appointments.

**Resolutions Committee**

Joseph Silvestro, Gloucester County, New Jersey

**Credentials Committee**

Richard Greek, San Luis Obsipo, CA

**Auditing Committee**

Robert Gunja, Kansas City, Kansas

**Nominating Committee**

Allan Nelson, State of Connecticut

Sidney Colbrook, State of Illinois

Charles Gardner, Suffolk County, NY

Maxwell Gray, State of Florida

Sharon Rhoades, State of Arizona

George Shefcheck, State of Oregon

N. David Smith, State of North Carolina

**Special Committees and Task Forces**

**ISO 9000 Task Force**

David Dikken, State of Minnesota

Michael Dynia, State of Connecticut

L. F. Eason, State of North Carolina

Ken Fraley, State of Oklahoma

Steve McGuire, State of Illinois

Kelly Moody, State of Arizona

Richard Calkins, Rice Lake Weighing Systems

Jerry Everhart, EG&G Mound Applied Technologies

Mark Kline, Troemner, Inc.

Richard Weber, 3M Company

Georgia Harris, NIST

**Privatization Work Group**

Allan Nelson, State of Connecticut

Sidney Colbrook, State of Illinois

Jennifer Colman, Food Marketing Institute

Thomas Geiler, Barnstable County, MA

Darrell Guensler, State of California

Randall Hutton, Winn-Dixie Stores, Inc.

Chip Kloos, Hunt-Wesson, Inc.

N. David Smith, State of North Carolina

Thomas Stabler, Mettler-Toledo, Inc.

Daryl Tonini, Scale Manufacturers Association

Richard Tucker, Tokheim Corporation

### **National Type Evaluation**

**Allan Nelson**, State of Connecticut  
For his service as chairman of the National Type  
Evaluation Board of Governors

**John Elengo, Jr.**  
For his service as Chairman of the National Type  
Evaluation Program Technical Committee and  
Chairman of the Weighing Sector

### **President's Award**

This is the ninth annual presentation of the president's award. This award is given for two levels of achievement.

First is the banner presented to those directors representing states that have 100% membership, both state and local weights and measures officials, in the National Conference on Weights and Measures for the first time in the membership year July 1, 1993 ending June 30, 1994.

Those states that repeat with 100% membership are awarded a streamer for their banner. A streamer is presented for each year the state qualifies.

The second level of the President's Award is a certificate presented to any state in which all of the weights and measures officials from the state office are members of the conference."

### **First Year Banners**

Banners are awarded to the District of Columbia and to the State of Tennessee for 100% membership in the National Conference on Weights and Measures for the membership year beginning July 1, 1993 and ending June 30, 1994.

#### **Streamer Awards for the Second Year**

Territory of the U.S. Virgin Islands

#### **Streamer Awards for the Third Year**

Commonwealth of Puerto Rico

#### **Streamer Awards for the Fourth Year**

State of Colorado

#### **Streamer Awards for the Fifth Year**

State of Montana

State of Oregon

State of Utah

State of Washington

State of Wyoming

#### **Streamer Awards for the Sixth Year**

State of Arizona

State of Michigan

State of New Hampshire

State of Virginia

#### **There are no Streamers for the Seventh Year**

## Honor Awards

### **Streamer Awards for the Eighth Year**

State of Alaska  
State of Delaware  
State of Idaho  
State of Kansas  
State of New Mexico  
State of South Dakota

### **Streamer Awards for the Ninth Year**

The following two States have had 100% membership in the National Conference on Weights and Measures for their States since the beginning of the award. These two States continue to participate 100% in the membership program.

State of Arkansas  
State of Nebraska

### **President's Certificate**

Five States qualify for the President's Certificate, with 100% of their State office staff members for the 1993-94 conference year:"

#### **First Year Award**

State of Connecticut  
State of Missouri

#### **Second Year Awards**

State of Massachusetts

#### **Third Year Award**

State of Illinois

#### **Fifth Year Awards**

State of Maine  
State of New York  
State of Wisconsin

Twenty-nine States, overall, including the District of Columbia, the Commonwealth of Puerto Rico, and the Territory of the U.S. Virgin Islands, have been awarded banners throughout the years; 9 States have certificates, for a total of 38 States and Territories.

## **Trading Standards in the United Kingdom - Training, Education, and Qualifications for Generalists and Specialists**

Paul Allen, Chairman  
Institute of Trading Standards Administration  
East Sussex, England

### **Background**

Mr. Chairman, ladies and gentlemen, I am delighted to have been invited to address your National Conference on Weights and Measures for a second time. The first, back in 1974, was part of a Winston Churchill Travelling Fellowship to study consumer protection in the food industry in America and Canada. My Fellowship took me to New York City, where I met New York's Consumer Affairs Commissioner, Mrs. Ellinor Guggenheimer. We visited the City's excellent Small Claims Court and saw their first-class weights and measures inspection service in action in a Harlem supermarket.

I then spent a week with the County of Monroe Weights and Measures Service and met, amongst many other friends, Charles Tooker, the Editor of the New York State Weights and Measures Association Newsletter. Charles has been keeping me in touch with weights and measures matters in the USA ever since by sending me the Newsletter on a regular basis. I was, therefore, delighted to see recorded in the 430th edition (February/March 1994) that the NYSWMA made a special presentation to Charles for 42 years service as editor of their Newsletter. What an achievement!

My journey then took me to Washington where I met your Executive Secretary, Dr. Carroll S. Brickenkamp, and friends at your Annual Meeting. From there I travelled via Boston, Toronto, Ottawa, Chicago to the Napa Valley and the University of California at Santa Cruz, to interview Ralph Nader. And so it is a double pleasure to be back in California at your 79th Annual Meeting.

### **Trading Standards in the United Kingdom**

Since 1878 Inspectors of Weights and Measures have carried out their statutory duties, employed by local authorities and certified as competent by central government, as a result of an examination, including an oral and a practical.

As from 1976 trainee Inspectors of Weights and Measures - now called Trading Standards Officers - have been required to register with the Examinations Department of the Local Government Management Board. The student can then commence an approved course of study for the Diploma in Trading Standards. The Diploma is awarded by the Diploma of Trading Standards Council, which has representatives from local authorities, the Government and the Institute of Trading Standards Administration, sitting on its Council.

The purpose of the new Diploma in Trading Standards (DTS) was to recognise that Weights and Measures Inspectors had become responsible for a whole range of consumer protection functions in addition to their traditional role of ensuring correct metrology standards.

Before being registered for the Diploma, trainees must be employed by a public authority in the United Kingdom within a trading standards department or in another appropriate organisation acceptable to the Council AND must have obtained qualifications in English, Mathematics and Physics.

The DTS examination comprises the following:-



### **Part I**

- i) General and Trading Standards Laws (2 papers)
- ii) Science, materials and principles of measurement (2 papers)
- iii) Economic and Commercial Practice
- iv) Statistics and Quality Control

### **Part II**

- i) Consumer Protection Law (2 papers)
- ii) Weighing and Measuring Technology
- iii) Quality Assurance
- iv) Enforcement and Advice
- v) Professional Practice - A written paper and a project report
- vi) Practical and Oral Examinations.

In addition, a candidate must complete two practical Training Workbooks to the satisfaction of his/her Chief Officer and the DTS Council.

For the period 1878 - 1976 there was relatively little change in the role of an inspector of Weights and Measures. In some authorities - mainly those covering rural areas - the responsibilities of weights and measures inspectors included Food and Drugs; Agriculture including fertilisers and feeding stuffs; and Merchandise Marks. In more urban authorities additional responsibilities included Shops (Sunday Trading), Explosives, Poisons and Petroleum Licensing. The qualifications, however, only related to metrology. Hence the change to the all embracing Diploma in Trading Standards.

To illustrate the pace of change, the original qualification lasted for almost 100 years. Less than 20 years since introducing the DTS, it is now under review for two major reasons.

First, the United Kingdom's entry into the European Economic Community - now known as the European Union - but still referred to as the Common Market, has required Member State Governments to look at the competence of Food Inspectors and Food Authorities.

Second, the Institute itself passed the following motion at its 1991 Annual General Meeting:

"This Annual General Meeting of the Institute, in recognising the serious shortfalls of trained people with competent skills and knowledge to carry out trading standards functions, instructs the Institute Council, (1) to bring forward to the 1992 Annual General Meeting of the Institute proposals for an all-embracing training system, that is modular in structure, accessible to those in trading standards departments and leads to the award of a nationally recognised qualification, and (2) to consult and seek agreement of the DTS Council, and other appropriate bodies, to incorporate the present statutory qualification and the DCA into the above training strategy."

### **Generalists**

The Diploma of Trading Standards examination provides a sufficiently wide background to allow newly qualified officers to carry out all or any of the functions allocated to Weights and Measures/Trading Standards/Consumer Protection Authorities. However, in practice they are soon allocated to specialist teams and become mainly responsible for -

metrology (weights and measures)



or quality (food and agriculture)  
or safety (consumer safety/product safety)  
or fair trading (consumer credit/consumer advice)  
or investigations  
or some specialist combination of the above.

### Specialists

The requirements of the Additional Food Control Measures Directive (93/99/EEC) states -

"Member States shall ensure that the competent authorities have, or at least have access to, a sufficient number of suitably qualified and experienced staff, in particular, in areas such as chemistry, food chemistry, veterinary medicine, medicine, food microbiology, food hygiene, food technology and law, so that controls referred to in Article 5 of Directive 89/397/EEC (The Official Control of Foodstuffs) can be carried out adequately."

The Official Control of Foodstuffs Directive envisages a single market in foodstuffs and therefore requires Member States to ensure that they have well qualified 'specialists' able to interpret and enforce the law in a consistent manner throughout the Union. This means that our generalist DTS qualified inspector may be required to specialise in food and agriculture law enforcement after the transitional period which ends in the year 2000, if he or she wishes to continue this aspect of work. As for foodstuffs, it is likely that similar requirements will be introduced for most of our other responsibilities including metrology, consumer safety and fair trading before the end of the century. This will in fact do nothing more than recognise what is already happening in practice.

### The Kibel Report

The resolution passed at our AGM resulted in the setting up of an Education and Training Working Group of which I was the Chairman and Regina Kibel was the Academic Adviser. The report was written by Regina Kibel and was published in February 1992. It has become known as the Kibel report and its main aim was and is as follows:-

"In the light of the AGM resolution and the discussion at the open meeting, the group took its aim to be to ascertain to what extent existing qualifications and associated training meet contemporary needs and foreseeable developments, and to suggest if possible qualification and training patterns which are more flexible and of easier access to the full range of staff within the service, thus making fuller use of the potential of existing staff at all levels, and improving the flow of appropriately qualified staff to perform the very varied functions for which the departments are responsible."

Some seventeen detailed recommendations were made in the Report and these are being implemented by my successor and currently the Vice-Chairman of ITSA, Gordon Gresty.

Final Report of the  
Executive Committee

Thomas F. Geiler, Chairman  
Director of Barnstable Consumer Affairs  
Hyannis, Massachusetts

Allan M. Nelson, Chairman of the NTEP Board of Governors  
Director of Weights and Measures  
Department of Consumer Protection, Connecticut

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**Table C**  
**Voting Results**

Reference Key No.	House of State Representatives		House of Delegates		Results
	Yes	No	Yes	No	
100 (Consent Calendar)	46	0	71	0	Passed
100 (in entirety)	45	0	70	0	Passed

## **Detail of Items**

### **Part I - Executive Committee**

#### **101-1 I Organization, Appointments, and Assignments, Status Report**

The number and variety of standards needed by modern commerce have greatly increased. The national and international impact of the standards developed and recommended by the National Conference on Weights and Measures have also grown as the mission of the NCWM expands from development of legal metrology standards only for State weights and measures regulatory agencies to standards for private industry and Federal regulatory agencies as well.

At the 78th Annual Meeting, in July 1993, Jim Truex was unanimously voted Chairman-Elect. This created a vacancy in the Executive Committee. Hence, the Constitution and Bylaws require that the Executive Committee replace members, Les Barrows, Missouri, was selected to complete Jim Truex's term. However, Mr. Barrows resigned from weights and measures this spring. Mr. Sidney Colbrook, IL, was unanimously elected by the Executive Committee to complete Jim Truex's term, which will end at the Annual Meeting of July 1995. In addition, Chairman Geiler made the following appointments and stressed the superb work of volunteers as essential to meet NCWM goals.

Fred Clem to act as Assistant Treasurer

National Type Evaluation Technical Committee (NTETC) Measuring Sector:

Debbie Joines, Dresser Wayne, to replace Larry Murray

Stan Retrum, Shell, API

Richard Huff, Universal Epsco

NTETC Grain Moisture Meter Sector:

Don Onwiler, NE

Under the Laws and Regulations Committee, the H133 Work Group:

Kristie Anderson, Everett, WA

Under the Multiple Dimension Measuring Devices Work Group:

Steve Cook, CA; and

R. W. Wothlie, MD.

#### **101-2 I Organization, Extend Tenure of Executive and Budget Review Committees; Specify Membership of Budget Review Committee**

**Background:** Traditionally the Chairman appoints a Budget Review Committee composed of senior members who often are already serving on the Executive Committee. Since this Committee reports to the Executive Committee, which makes the final decisions concerning the budget, it was suggested that key membership on the Budget Review Committee should be selected from Executive Committee members to ensure an ability to explain decisions to the Executive Committee and to support key decisions made by the Budget Review Committee.

In addition, due to their shorter tenure, the committee experience and institutional memory in the Executive Committee and the Budget Review Committee are less than in the Specifications and Tolerances and other standing committees. With 3-year terms, by the time committee members become familiar with the work of the Executive or Budget Review Committee and are ready to contribute towards long-range goal and objective setting, their tenure is over. In contrast, the standing committees enjoy 5-year tenures. Since it may take 2 years or more to become completely comfortable with the roles and responsibilities of any committee, the other standing committees can utilize their experienced members' capabilities over a longer period.

**Discussion:** At the Interim Meeting, the Executive Committee decided not to change its own size or tenure. The Committee feels that there is reason to change its membership more rapidly than other committees, to allow new views

to be accommodated more quickly, making it less likely for positions to become entrenched. Two new members are selected for the Executive Committee each year; and if the tenure of the Committee were extended beyond 3 years, more members would have to be added, or fewer members elected each year. The Committee is already twice as large as other standing committees, so it was decided not to expand its size, as to whether fewer members should be elected each year, it was stated that it would be wrong to present the voting membership with only one candidate for the Executive Committee each year. Therefore, no change is recommended to the 3-year term of the Executive Committee, or to its make-up, at this time. The Associate Membership Committee (AMC) was invited to continue the development of its proposal to add Associate members to the standing committees (see 101-3).

Concerning the Budget Review Committee's tenure and membership, a suggestion was made to change its Chair from the NCWM Chairman to the NCWM Chairman-Elect because its advice on the NCWM budget pertains to part of the year in which the Chairman-Elect would be Chairman. There were several negative responses to this suggestion because it was felt that the Chairman-Elect would not be sufficiently knowledgeable about the NCWM budget unless he or she had formerly been an Executive Committee member. Also, the budget that is formulated in May or June of any year is the budget for the following calendar year, which is half the year of the Chairman taking office in July and half the year of the Chairman-Elect selected in July. Since it is a joint tenure, and because the budget must be approved by the entire Executive Committee, it was not felt to be sufficiently important to change the prerogative of the Chairman to chair the Budget Review Committee. It was decided to expand the membership of the Budget Review Committee beyond the Executive Committee, and very important to add associate members as voting members. It was therefore decided that (1) the Chairman, Treasurer, and Executive Secretary would continue to be members on the Budget Review Committee and adequately represent the Executive Committee; (2) the tenure of the Budget Review Committee would be increased from 2 to 4 years; and (3) two active and two associate members would be named to the committee, with the first appointments made for staggered terms.

#### **Committee Recommendation:** Revise NCWM Bylaws:

The Finance Committee, which shall also serve as the Budget Review Committee, shall be appointed by the Conference Chairman. It shall consist of him/her the NCWM Chairman as Chairman of the Committee, two weights and measures officials as voting members (each with a two year term), and the Treasurer and Executive Secretary as ex-officio voting members. One associate member shall serve in an advisory capacity, without vote. In addition, the Chairman shall appoint two active and two associate members to serve on a rotating basis for four-year terms.

Since this is a change in the Bylaws, the recommendation will be published in the Interim Report and Final Report this year, but not voted upon until July 1995. The proposed changes are intended to add to the experience and knowledge of the Budget Review Committee, and will not incur additional expenses for the Conference. The associate members would have their expenses reimbursed by their companies. Since there were no objections from the floor, the incoming Chairman appointed members to the Budget Review Committee as if the change to the Bylaws had been adopted by the Conference. Therefore, the incoming Chair appointed two associate members rather than just one. (See the incoming Chairman's address for appointments.)

### **101-3 I Organization, Role of Associate Members**

**Discussion:** The Associate Membership Committee (AMC) of the NCWM proposed that "Industry Representatives" (IR) be created for the Executive, Education, Laws and Regulation, and Specifications and Tolerances Committees with a term of 3 years. Candidates would be identified for the Conference by the AMC and each candidate would be either appointed by the Chairman or nominated by the Nominating Committee, depending upon which Committee the candidate is recommended. The regional weights and measures associations are encouraged to discuss and refine this proposal with their associate membership.

**Background:** In the past, the Associate Membership Committee has been primarily responsible for hosting social events, but the scope of industry involvement has broadened over the past several years for the betterment of all. The regional Associate Membership Committees have allocated part of their funds for purchasing video equipment for Weights and



## Executive Committee

Measures training. The new NCWM dues structure allows the Associate Membership Committee and the NCWM to jointly sponsor events and allocate excess monies to worthwhile mutual projects, such as the completion of the consumer pamphlet published by the Liaison Committee, in an attempt to increase Weights and Measures visibility and awareness. This is a model for how the two sectors can and should continue to work together, but additional representation and participation by Associate members is now being proposed by the Associate Membership Committee. Associate Membership Committee Chairman Chris Guay, Procter and Gamble, designated an AMC task force in 1993 to pursue this subject to prepare a presentation to the Committee. Members of this task force are Bill Braun (WHB Resources), Bill Corey (American Frozen Foods), Richard Davis (James River), Chip Kloos (Hunt-Wesson), and David Quinn (Fairbanks Scales). They have worked with the standing committee members and the remaining AMC members to prepare a plan having broad-based industry input and agreement. A first draft proposal was provided by the AMC task force to the Executive Committee in January. The latest draft provided at the 79th Annual Meeting is reprinted below:

**Proposal:** The Associate Membership Committee of the NCWM submits the following revised proposal for consideration at the NCWM Interim Meeting in January, 1995. We are submitting this proposal in order to allow for its discussion at the autumn 1994 regional meetings.

The Associate Membership of the NCWM proposes the creation of one Industry Representative position for the following NCWM committees: Executive, Education, Laws and Regulations (L&R), and Specification and Tolerances (S&T). This vote was unanimous at the AMC meeting held during the 79th Annual Meeting of the NCWM. IRs would serve 3-year terms on each specified committee. This proposal will require modifications to the existing NCWM Bylaws and to the AMC Bylaws. Proposed changes to the NCWM Bylaws are contained herein. A draft of the proposed changes to the AMC Bylaws will be forwarded to the Executive Committee in the next few months. The AMC will vote on the draft AMC Bylaws at the January 1995 NCWM Interim Meeting.

At the 78th National Conference in Kansas City, 1993, Chairman Geiler discussed the impact of reduced funding and staffing on the Conference and need for everyone, both in the public and private sector to participate in NCWM to the fullest. Generally, the associate membership has felt our ability to contribute to the NCWM was being underutilized. The abolishment of the NCWM Liaison Committee at the 79th Annual Meeting, dissolved the associate membership's one formal role in the NCWM, leaving this constituency, comprising approximately 52% of the conference without formal representation. The proposal being put forth by Associate membership is truly believed to adhere to the guidelines mandated by AMC Chairman Guay:

1. Any proposal must be carefully and thoughtfully developed; it must be complete and thorough.
2. It must have broad-based input and acceptability to industry.
3. It must be fair to ALL industry. It must not provide any firm or group of firms with an undue competitive advantage.
4. It must benefit NCWM.
5. It must be sustainable for the AMC and NCWM. There must be long-term commitment to plan's implementation.
6. It must be actionable.

The AMC has obtained a legal opinion on the legal implications to the NCWM and the associate membership of this proposal from the Boston law firm of Cosgrove, Eisenberg, and Kiley that identifies no material legal issues. There are also many other industry/government instances where industry representative roles have been used and are being used successfully.

The AMC recommends the following:

1. Creation of one Industry Representative (IR) position on the following NCWM committees: Executive, Education, Laws & Regulations (L&R) and Specifications and Tolerances (S&T).
2. Designation of IRs as Non-Voting Members.
3. Designation of IR role as a 3-year position.

4. IR election/appointment will be consistent with existing NCWM procedures for committee election/appointment. The IR candidate for the Executive Committee will be submitted to the NCWM Nominating Committee. IR candidate(s) for standing committees will be submitted for appointment by the Conference Chairman.
5. IR candidates must be NCWM Associate members.
6. IR candidates require approval by a minimum 2/3 majority of Associate members present at an openly scheduled AMC meeting.
7. The Chairperson of an NCWM committee can exclude the IR from participation on issues/discussions viewed confidential.
8. An IR can select, with the NCWM Chairperson's concurrence, an IR Alternate (IRA) or "Backup" to temporarily participate in committee discussions in place of the IR.
9. The IR's organization will be responsible for the IR's travel-related expenses. The NCWM will not be responsible for reimbursing these expenses.
10. Issues of IR misconduct or "unfair advantage" will be mediated by the Conference.

#### Industry Representative (IR) Proposed Responsibilities

1. An IR's responsibility is to serve an NCWM committee in both advisory and intermediary roles, providing general industry perspective and facilitating industry/committee communication.
  - A. An IR does not represent any particular organization or group, but rather represents all interested persons within the jurisdiction of the committee to which the IR is selected to represent.
  - B. The IR represents all members of an industry, and not any particular association or company. If a matter comes before the committee that directly or indirectly affects the organization employing the IR, the IR should inform the committee but need not be absent from the discussion or exclude oneself from participation.
  - C. The IR, having unique knowledge of relevant industry practice, should serve as an additional intermediary between the committee and interested persons whom the IR represents, facilitating more efficient review of items.
  - D. An IR may not make a presentation to that committee during a public hearing held by that committee.
  - E. The IR may not engage in unseemly advocacy or attempt to exert undue influence over the other members of the committee. An IR may be removed for good cause (excessive absenteeism, demonstrated bias that interferes with objective advice, violation of applicable rules and regulations).
2. An IR is a nonvoting member of the NCWM committee. The IR cannot participate in votes pertaining to committee issues or policies. The IR can participate in voting on procedural matters such as approval of committee minutes and future meeting dates.
3. An IR will not have access to data and information that constitute trade secrets or confidential commercial or financial information.
4. An IR is subject to and shall abide by, all rules and regulations adopted by the NCWM and the committee.

The AMC recommends the following changes to the NCWM Bylaws: Redlined (shaded ) language is proposed to be added. Cross-through language is proposed to be deleted.

#### Article V; § 2; A Membership (other than Executive, Finance, and Credentials Committee)

The membership of each of the standing committees is a normal complement of five members appointed by the Conference Chairman from the active membership on a rotating basis for five-year terms, or until a successor is appointed, and one nonvoting member appointed by the Conference Chairman from the associate membership for a three-year term.

When it is necessary to make an appointment to any of the standing committees to fill a vacancy caused by the death, resignation, or retirement from active service by a committee member from the active membership, the

## Executive Committee

appointment is for the unexpired portion of the member's term. Such an appointment from the Associate membership would be for a term covering through the next 3 NCWM Annual Meetings.

### Article V; § 2; B

The Executive Committee consists of the President, Executive Secretary, the Conference Chairman, the Chairman-Elect, the most recent still active Past Chairman, the Treasurer, and six members elected at large from the active membership ~~the latter~~ to serve 3-year staggered terms, and one member elected from the associate membership.

The President, and Executive Secretary, and associate member do not have votes on matters before the Executive Committee.

**Recommendation:** The Executive Committee encourages the Associate Membership Committee to continue its work to address Associate membership on the standing committees. The Committee recommends that the Associate Membership Committee Task Force contact other standing committee members and regional associations in order to determine and address any of their concerns with the proposal. Chairman Geiler pointed out that, under the present Constitution and Bylaws, the Chairman can appoint one or more associate or advisory members as consultants to any committee, but the Executive Committee wants to formalize the Associate member role in standing committee work.

Both private and public sector members of the NCWM strive for equity, fair value, and a level "playing field." Over the past 10 years, Associate members have become key members and chaired the National Type Evaluation Technical Committee and its sectors. Associate members provide important technical membership in many NCWM task forces and other work groups, including the Petroleum Subcommittee. With funding becoming harder to get and staffing being reduced in industry and government programs, mutually shared goals and objectives must be better coordinated. Increased integration of public and private sector's abilities, knowledge, and experience will provide the NCWM with the necessary talent and resources to prosper in a complex marketplace environment.

The Executive Committee views the AMC as a positive step in the evolution of the NCWM and believes that the AMC should continue to pursue its charter. Several members of the Executive Committee voiced concerns that they thought could be worked out:

1. If the IR were required to be a member of the AMC, or if the AMC nominated the IL candidates, the Constitution and Bylaws of the AMC should ensure balanced representation by all segments of industry, probably by incorporation or reference in the NCWM Constitution and Bylaws. The Executive Committee recommends that the AMC review its charter with this issue in mind.
2. Although it is a positive move to add associate membership to the Executive and Education Committees, it might be quite difficult to add an associate member to either the Specifications and Tolerances or Laws and Regulations Committee. Even if the IR were to recuse him/herself on issues of a competitive nature, the NCWM might be subject to legal challenge from industries that did not achieve their objectives at the NCWM and saw a competitor's name on the committee membership listings. For example, how could a petroleum or alcohol industry representative be a member of the Laws and Regulations Committee (even if they recused themselves when the issues were discussed) when issues of the Petroleum Subcommittee came before it? Protections would have to be incorporated in procedure, due process, and even presence at the Committee table during specific issues. Perhaps it would be easier to (a) incorporate associate membership into the Executive Committee (not the NTEP Board of Governors); (b) determine whether it would be feasible to incorporate associate membership into the Education Committee (which seems feasible to the Executive Committee); and (c) implement these changes while studying and finding alternative ways to address the associate membership on the S&T and L&R Committees.
3. How would the associate members be selected? What number of members would constitute a quorum at the Associate Membership Committee meeting? Would a slate of candidates be sent to all Associate members in anticipation of those who desire attending the voting session? Would the Associate membership have the opportunity to vote at the Annual Meeting or Interim Meeting from a single slate or from alternatives; what would



the role of the Associate Membership Committee and the associate membership each be in the nomination and selection process? For example, the Associate Membership Committee has no membership from the liquid-measuring industry. How is this to be addressed?

#### 101-4 I Organization, Review of Mission Statement and Need for Long Range Plan

The NIST Office of Weights and Measures annually prepares a long range (5-year) plan in order to set quantitative objectives for measuring progress towards meeting its goals. Much of this plan is focussed on objectives of the National Conference on Weights and Measures. Since this document is prepared by OWM, it seems appropriate that the Executive Committee review and prepare a long range plan for the NCWM, using the OWM long range plan as a model and stepping-off point. Additional material might be the reports of the Task Force on Planning for the 21st Century.

As the first step in this process, Mr. James Harnett (Orange Co., CA) proposes that the Conference review its "mission statement," that is, its goals expressed in a short, easy to remember, pithy statement, for example, "to maintain equity in the marketplace."

The NCWM Constitution has a rather lengthy statement of objectives. The Executive Secretary provides a first draft of a goal statement in the context of the NCWM Constitution and Bylaws.

#### Article II - Goals and Objectives

The goals of the National Conference on Weights and Measures are to ensure equity in the marketplace between buyer and seller and to provide and enhance the fairness of the commercial trading environment by meeting the objectives given below.

The objectives of The National Conference on Weights and Measures are:

- A. *Forum.* To provide a national forum for the discussion of all questions related to weights and measures administration as carried on by officials of the Federal Government and regulatory officials of the States, Commonwealths, Territories, and Possessions of the United States, their political subdivisions, and the District of Columbia for the following purposes:
- B. *Mechanism.* To provide a mechanism to establish policy and coordinate activities within the Conference on matters of national and international significance pertaining to legal metrology.
- C. *Consensus.* To develop a consensus on uniform laws and regulations, specifications, and tolerances for weighing and measuring devices, and on testing, enforcement, and administrative procedures.
- D. *Uniformity.* To encourage and promote uniformity of requirements and methods among jurisdictions.
- E. *Cooperation.* To foster cooperation among regulatory officers themselves and between them and all of the many manufacturing, industrial, business, and consumer interests affected by their official activities.

The Executive Committee encourages the regional associations to provide their thoughts and observations on the mission statement of our associations; all the associations should share the central reason for their existence and their mission.

#### 101-5 I Organization, Education, Administration, and Consumer Affairs Committee

At the Interim Meeting, the Executive Committee asked the Education Committee to hold a separate meeting with selected Executive Committee, active, associate, and advisory members to reassess its long term objectives and means to achieve those goals.

## Executive Committee

1. Start with the Bylaws of the NCWM as a guide to prepare an overall plan for the United States. The NCWM Bylaws state that the scope of the Education, Administration, and Consumer Affairs Committee embraces all matters dealing with:
  - a. the education and training of weights and measures officials,
  - b. the promotion of weights and measures principles and techniques among the general public and the users of weighing and measuring devices,
  - c. the development of weights and measures principles and techniques among the general public and the users of weighing and measuring devices, and
  - d. the identification of commercial weights and measures practices and problems that are of concern to consumers.
2. Formulate a management plan for all aspects of weights and measures training, beyond the development and maintenance of modules, including training delivery in order to manage the "National Training Program."
3. Assist NCWM to identify all weights and measures training and public relations resources, identify gaps, and formulate a future system that is greater than the sum of the parts.

The Education Committee was asked to assist the NCWM in understanding and planning an education system that will leverage all participants' and members' strengths. In discussion with the Education Committee, the Executive Committee praised the training module development and maintenance work of the Committee. The Executive Committee contrasted the provision of the training modules with the more extensive State Laboratory Program training and continuing educational requirements, pointing out the resultant high caliber of metrologists in the United States.

The only way that uniformity in weights and measures can be attained is through training, not only of field inspectors, but of weights and measures directors, device repair and installation staff, device users and packagers, and the general public. NIST OWM has had to reduce the training it can provide, but has always found someone in the United States to provide, and has paid for training that it has been asked to do; States have to plan for, budget for, and provide training. It might be necessary to provide additional incentives; a certification or accreditation program to prove that a jurisdiction is using standard procedures and enforcing uniform requirements might be one incentive. "Total quality management" and the ISO 9000 pressures are also prime reasons for emphasizing and providing training.

In April 1994, the Education, Administration, and Consumer Affairs Committee met with Associate members and with members of the Executive Committee to set new goals and objectives, and prioritize its work. See the Education, Administration, and Consumer Affairs Committee report for a report on this meeting. The Education, Administration, and Consumer Affairs Committee decided that the NCWM should change the name of the of Committee to Administration and Public Affairs, in order to indicate the importance of quality management of weights and measures programs in the Conference. Education will remain a primary objective of this Committee, but the objective of all administrators should be education for themselves and their staff.

The Executive Committee commends the Education, Administration, and Consumer Affairs Committee for their work and endorses the following proposal. The proposal is provided with anticipation that it can be placed on the Executive Committee's agenda next year and adopted into the NCWM Constitution and Bylaws in 1995.

The Draft Mission Statement for the Committee:

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

- effective program management,
- education, and
- public relations.

Objective 1: Develop and recommend administrative procedures and public relations programs

Objective 2: Educate weights and measures officials

Objective 3: Promote weights and measures principles and techniques among users of weights and measures devices and the general public

Objective 4: liaison with Federal agencies, State agencies, and other groups and organizations on issues within the purview of the committee

The Education, Administration, and Consumer Affairs Committee met at the Annual Meeting to finalize its recommendations to the Executive Committee and the Conference with respect to its management plan and the subgroups that would be recommended to be established to carry out the work of the new Committee.

## 101-6 VC Organization, Abolish Liaison Committee

This item was adopted as part of the Consent Calendar.

**Decision:** At the 1993 Annual Meeting, the NCWM endorsed the recommendation of the Liaison and Executive Committees to abolish the Liaison Committee by formal action of the National Conference at the next Annual Meeting. The NCWM Constitution and Bylaws requires that formal action may not be taken until the year after the Annual Meeting at which the proposed changes are presented; the action was proposed in 1993. It can now be acted upon at the 79th Annual Meeting. The Liaison Committee further recommended in 1993 to:

1. Assign general liaison responsibility to each of the standing committees.
2. Assign issue-specific outreach to each of the standing committees.
3. Include a strong reference to liaison responsibilities to each standing committee duty descriptions.
4. Request that each regional weights and measures association report on their activities and projects to the Executive Committee.
5. Assign Weights and Measures Week, the consumer brochure, and consumer group outreach to the Committee on Education, Administration, and Consumer Affairs.

**Committee Recommendation:** Revise Publication 1, NCWM Constitution and Bylaws, BYLAWS as follows:

### SECTION 2 - STANDING COMMITTEES

The standing committees are:

Executive Committee;  
Committee on Specifications and Tolerances;  
Committee on Laws and Regulations;  
Committee on Education, Administration, and Consumer Affairs;  
~~Committee on Liaison;~~  
Finance Committee; and  
Credentials Committee.

### SECTION 5 - DUTIES AND FIELDS OF OPERATION OF COMMITTEES

#### A. Executive Committee

(No changes to this section. Note that following section already incorporates liaison function as part of Executive Committee responsibilities.)

The Committee serves as a policy and coordinating body in matters of national and international significance which may include such areas as metrology, International Organization of Legal Metrology (OIML), American National Standards Institute (ANSI), International Organization for Standardization (ISO), American Society for Testing and Materials (ASTM), National Conference of Standards Laboratories (NCSL), and such internal matters as may be required.

The Committee annually presents a report to the Conference on its activities, which are subject to Conference ratification.

**B. Committee on Laws and Regulations**

The Committee on Laws and Regulations annually presents a report for Conference 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; and
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.
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 Conference 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. Committee on Specifications and Tolerances**

The Committee on Specifications and Tolerances annually presents a report for Conference 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; and
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 Conference 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.

**D. Committee on Education, Administration, and Consumer Affairs**

The Committee on Education, Administration, and Consumer Affairs annually presents a report for Conference action.

Its scope embraces all matters dealing with the:

1. education and training of weights and measures officials;
2. promotion of weights and measures principles and techniques among the general public and the users of weighing and measuring devices;
3. development and recommendation of administrative procedures and public relations programs; and
4. identification of commercial weights and measures practices and problems that are of concern to consumers; and
5. 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 Conference 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.



**~~E. Committee on Liaison~~**

~~The Committee on Liaison annually presents a report for Conference action. Its mission is divided into two categories as follows:~~

~~1. Liaison with Federal Agencies.~~

~~Intergovernmental (with NIST/USDA/FDA/ITC/DOD/Postal Service, etc.) contacts and relations on behalf of the Conference. This role involves explaining, advocating, and coordinating Conference positions, recommendations, and needs before Federal Government agencies and promoting uniformity among those agencies and with the NCWM.~~

~~2. Liaison with Other Groups or Organizations and Agencies.~~

~~This role involves public liaison with consumer groups, the associate NCWM membership, the retiree 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 of the NCWM.~~

**101-7 VC Organization, U.S. - Canada Mutual Recognition Work Group**

This item was adopted as part of the Consent Calendar.

At the 78th Annual Meeting, the NCWM endorsed the following policy with respect to the United States and Canada:

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 will necessitate the comparative analysis of type evaluation codes and test procedures together with the intent of streamlining and minimizing differences insofar as possible to enable efficient device evaluation while preserving the technical capability and competence of their mutual laboratories.

A U.S.-Canada Mutual Recognition Work group was formed in 1993 with representation from Canada's Legal Metrology Branch, four NTEP participating laboratories, and NIST OWM. It has met frequently since April 1993 in the United States and Canada. Progress is on schedule toward meeting the first stage objective of mutual recognition of type evaluations between the United States and Canada for bench/floor scales, weighing/load receiving elements with a capacity up to 500 kg (1000 lb), and digital indicators by April of 1994. A report was provided of the status at the Interim Meeting.

A jointly agreed program statement has been prepared by Mr. Robert Bruce, Canada LMB, and the Executive Secretary, describing the objectives and operation of this first programmatic implementation for review by the Executive Committee at the Interim Meeting. All milestones were met, and the program was commenced on April 1, 1994.

**Committee Recommendation:** The Executive Committee recommends that the NCWM adopt the Mutual Recognition Agreement as a statement of policy of the NCWM, and that the NCWM operate on the basis of this policy. The U.S. - Canada Mutual Recognition Program was inaugurated April 1, 1994. Several device manufacturers have already applied for evaluation under the program.

The Committee had recommended at its Interim Meeting that the agreement go forward for formal signatures by U.S. Federal government representatives. After consultation with the legal advisor of the National Institute of Standards and Technology, the Executive Secretary advised the Executive Committee that the mutual recognition agreement could be effective by adoption of policy by the National Conference on Weights and Measures and the Legal Metrology Branch of Canada, without obtaining signatures of U.S. Federal government representatives uninvolved with the National Type Evaluation Program. Therefore, the Committee recommends adoption of the following policy:

## Mutual Recognition Agreement

### *1. Purpose*

The purpose of this Mutual Recognition Agreement (MRA) is to set out a working relationship to implement applicable provisions of the Free Trade Agreement (FTA) by providing for the mutual recognition of the device evaluations administered and performed by the Legal Metrology Branch (LMB) of Industry and Science Canada and by the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures (NCWM) of the United States.

### *2. Background*

The Government of the United States of America and the Government of Canada are parties to the FTA. Chapter Six of the FTA applies to technical standards, and Article 604 of this agreement provides in part 1 that:

To the greatest extent possible, and taking into account international standardization activities, each party shall make compatible its standards related measures and procedures for product approval with those of the other party.

The LMB and NTEP operate ongoing type evaluation systems for commercial 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 LMB's laboratory, manufacturers requested that the United States and Canada (1) combine their evaluation tests and (2) recognize either NTEP laboratory or LMB laboratory results of the combined evaluation as the basis upon which NTEP and LMB would each issue their evaluation documents (either the NTEP Certificate of Conformance or the Canadian Notice of Approval). Expected benefits include: increased uniformity of test methods reducing unnecessary differences, misunderstandings, and unnecessary duplications; reduced costs and improved turn-around time by accessing a single source for type evaluation for both nations; increased competitiveness for both U.S. and Canadian manufacturers by speeding the time from design to the end markets.

The following policy was adopted in January 1993 by the National Conference on Weights and Measures, in concert with the Legal Metrology Branch, Canada:

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 will necessarily involve 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.

### *3. Agreement*

The United States National Type Evaluation Program (NTEP) and Canada's Legal Metrology Branch (LMB) agree to recognize each other's type evaluation results:

- NTEP will recognize the results of the tests performed by the LMB for the purpose of issuing NTEP Certificates of Conformance for the device types set out in the annex to this agreement.

LMB will recognize the results of the tests conducted by the NTEP Participating Laboratories for the purpose of issuing a Canadian Notice of Approval for the device types set out in the annex to this agreement.

Each party will continue to issue its own document (either the NTEP Certificate of Conformance or the Canadian Notice of Approval).

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 test 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.

#### *4. Collaboration*

Both parties will collaborate to eliminate or minimize differences in requirements and test methods so as to enable efficient device evaluation.

#### *5. Resolution of Complaints*

This MRA does not create obligations binding 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.

#### *6. Duration and Termination*

This MRA will become effective on April 1, 1994. 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. Application for Type Approval*

Under this agreement, any applicant for type approval is free to apply to either country when requesting type approval in either Canada, the United States or both countries.

### Mutual Recognition Agreement

#### ANNEX

List of device types that are subject to provisions of the Mutual Recognition Agreement.

1. Electronic noncomputing bench and platform scales or separate weighing elements with a capacity up to and including 500 kilograms.



2. Electronic indicators for use with weigh scales.

## 101-8 I Organization, Privatization Work Group

The final report of the Privatization Work Group is included in Appendix A. The following text reports the status of the work as of the end of 1993.

Chairman Tom Geiler took over as representative from the Northeast in the Privatization Work Group and named Allan Nelson, CT, as Chair of the Privatization Work Group. In addition, Chip Kloos, Hunt-Wesson, was appointed to the Work Group. The Work Group has attacked several problems so far. (1) Members have met with and written State and local agencies, legislatures, and other managers to explain the need for retaining weights and measures oversight as a government responsibility. (2) The Work Group developed a set of overhead transparencies and slides available to all to explain either their own programs and why needed, or the component of a complete program. These efforts are directed at developing vocal customers who, in turn, demand government regulation of the marketplace.

Recognizing economic realities, the Work Group has outlined an effective program, but also realizes that government rarely has the resources to deliver that complete program. The Work Group therefore plans to explore in more depth how industry can play a more effective role in delivering the most effective program possible. Some areas to be explored include: minimum training; evaluating the tests performed by the testing agent; how to fund package testing and undercover buying and selling; and an accreditation system for weights and measures programs including their private company licensees.

The group met in Seattle, November 4-6, 1993 in order to discuss a study produced by a Washington State Task Force. The Task Force report indicated overall benefit of individual parts of weights and measures activities, for example, vehicle scale testing, and package testing. The Work Group consulted with Washington State Task Force members to further refine the economic generalizations made in Washington and to explore what needs to be collected in the future by any weights and measures jurisdiction to help in establishing priorities and measuring effectiveness.

Quantitative measurements of the effectiveness of a program or of changes to a program are of little value unless the same standards are used to evaluate the programmatic effects over time and across geographic regions, that is, from State to State. Therefore, the Work Group has begun to identify useful data that could be collected without too much effort and could be used to measure programmatic effectiveness within a jurisdiction and nationally. Illinois and Ohio, for example, have both reported that they were able to show a direct correlation between frequency of device inspection and compliance level. For example, all jurisdictions should be collecting, quantitative data on device errors at the time of test, rather than recording only whether the device was "in" or "out" of tolerance.

### *Think Dollars Rather Than Pounds*

When weights and measures officials find short weight packages, many jurisdictions compute the economic loss in dollars, applying the shortage found, to the amount of that product sold by a given retailer over some period of time. For example, a shortage of 0.02 lb for chicken breasts selling at \$5.00 per pound converts to a shortage per package of \$0.10. If the retailer sells 200 packages of chicken breasts per day, the economic shortage is \$20 per day, \$140 per week, \$560 per month, or \$6720 per year for that one kind of package in that one store. This is a common analysis for determining whether to impose a fine or take other legal action.

Economic gain or loss can be similarly estimated for direct sales using scales or meters. For example, if an individual truck scale under-records by 80 lb at approximately truck capacity, some estimate of the economic effect of that under-weighing can be made. If the truck scale weighing the full truck differs from the scale used to determine the tare, or if a stored tare value was determined at some other time, the under-registration does not even partially cancel out. In this example, if the trucks are gross weighed on that scale only in order to sell produce from the farm to a processor, and if the commodity is worth \$0.40 per pound, the potential for economic loss to the farmer is  $80 \text{ lb} \times \$0.40 = \$32$  per truck load. During a harvest season of 12 weeks duration, with an average of 100 trucks per day weighed on that scale, farmers are shorted \$3,200 per day, or \$16,000 per 5-day week, or \$192,000 for the 12 week harvest season.

### ***Compliance Level Translates into Money***

The ability to estimate economic profit or loss is substantial if a jurisdiction keeps records not just of the compliance level, based on knowing the number of devices out of compliance during a given round of tests, but also records the amount of error found for each device.

All jurisdictions should record not only whether a device is in or out of tolerance, but by how much. In addition, it is important to record how far from zero any scale is found. Most jurisdictions "sanitize" their data, routinely allowing the scale users to adjust their devices when found out of zero. The Work Group does not suggest that jurisdictions change this practice, but inspectors should record how far from zero the scale is found before adjustment. It is logical to assume that the scale would likely remain out of zero until and unless the inspector pointed out the problem to the scale user. Record the amount out of zero; this is potential economic gain or loss to the business and its customers if weights and measures inspection does not occur.

Armed with copies of the annual economic data from Supermarket News, and with motor fuel sales, agricultural sales, and road construction data from the local tax bureau, agricultural statistics division, and retail marketing associations, jurisdiction administrators can estimate the value of average shortages or overages on any class of devices either to buyers or sellers over time. The Work Group report is available upon request from the Office of Weights and Measures and will be published in the final report of the committee.

## **101-9 I Organization, ISO 9000 Task Force**

Georgia Harris provided a report at the Interim Meeting on the progress toward ISO Guide 25 conformance (equivalent to conformance to ISO 9002) of State weights and measures calibration laboratories by the end of calendar year 1994, and plans for NTEP Participating Laboratories to consolidate and document administrative procedures to conform to ISO Guide 25. Chairman Geiler requested that maps be prepared to show the status of State Weights and Measures Laboratories with respect to accreditation in specific areas and at specific levels. The importance of conformance to ISO 25 was stressed for those Participating Laboratories that might desire to offer OIML Certificates.

In 1994, the NIST National Voluntary Laboratory Accreditation Program (NVLAP) announced a new accreditation program for calibration laboratories. This is a fee-supported accreditation program that private laboratories need to assure their domestic and international customers of accurate measurements. The NIST OWM is funded to support the State legal metrology laboratories as part of the basic NIST mission to ensure traceability of standards in the States for legal purposes. Ms. Harris described the collaborations and cooperations that have led to NVLAP offering to issue its accreditation certificate to States that already have an OWM certificate. The State metrologists (through the work of the NCWM ISO 9000 Task Force) and OWM have been upgrading the accreditation criteria in NIST Handbook 143 during the past year and have assisted NVLAP in developing technical criteria for laboratories in the areas of mass and volume.

NVLAP has formally adopted *ISO Guide 25, General Criteria for the Acceptance of Calibration Laboratories* and related standards. Both NVLAP and OWM will give calibration laboratories, whether State or private, a one-year grace period to comply with all aspects of ISO Guide 25. NVLAP has also selected several State metrologists to participate as technical experts (assessors) for the evaluation of calibration laboratories.

The NVLAP and OWM partnership will provide additional recognition for State laboratories on a national and international level since NVLAP has a number of Memoranda of Understanding for mutual recognition with national and international organizations and countries. OWM will continue to manage the accreditation program for the States; NVLAP accreditation will be an additional benefit of compliance. NVLAP will offer accreditation to all State laboratories currently accredited under the OWM State Laboratory Program for 3-year periods. Many customers of the State laboratories want to know that the services of the State laboratories comply with ISO 9000 and/or ISO Guide 25 criteria. NVLAP's scope of accreditation will indicate "accredited to NIST Handbook 143" and will use OWM assessments of the laboratories as the basis for issuing accreditation certificates.

**101-10 I Publications, Status Report**

The costs of publishing archival publications, such as National Institute of Standards and Technology Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," and other NIST handbooks and final reports of the National Conference on Weights and Measures, are underwritten by the NIST. The cost of publishing intermediate publications needed to conduct the business of the NCWM, such as the Interim Meeting Agenda and the Interim Meeting Reports, is assumed by the Conference. Any publications that the Conference desires to publish and sell are also produced at Conference expense. For example, a full set of NCWM Publication 5 (Index of NTEP Certificates and facsimiles of the Certificates) is now a four-volume collection costing \$75. Discussion centered around how Publication 5 is being received in its new format. Nebraska and Ohio do not provide their field inspectors with full copies: the officials do not want to carry that much paper around with them. Ohio would like every official to have it, but the costs are too high and Ohio continues to prepare its own short version of Pub 5. The Executive Committee members noted that the greatest complaint of their field enforcement officials is the lack of documentation, especially for load cells, left with the device installation.

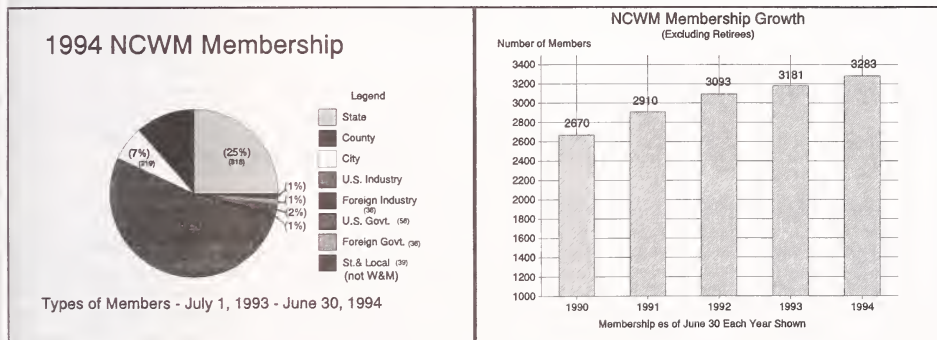
**NIST and NCWM Publication Summary  
Fiscal Year 1994**

<b>NIST Publications</b>				
<b>NIST Publication Title</b>	<b>Quantity (estimate)</b>	<b>Total Printing Costs (estimate)</b>	<b>Total Postage (NIST)</b>	<b>Total Printing &amp; Postage</b>
Handbook 44 1995 edition	3,800	\$6,000	\$5,624	\$11,624
SP 854 Report of 79th NCWM	3,800	8,000	3,990	11,990
Handbook 130 1995 edition	3,800	6,000	3,200	9,200
Handbook 133 1995 edition	3,800	6,000	5,624	11,624
<b>Totals (All NIST Expense)</b>	<b>15,200</b>	<b>\$26,000</b>	<b>\$18,438</b>	<b>\$44,438</b>
<b>NCWM Publications (Printed at Conference Expense Mailed at NIST Expense)</b>				
Pub 2 Membership Directory	2,350	\$6,200 (NCWM)	\$3,404	\$9,604
Pub 5 Index of Dev Evals, 6th Ed	500	2,580 (NTEP)	740	3,320
Pub 15 Interim Agenda	3,200	3,200 (NCWM)	6,390 (First Class)	9,590
Pub 16 Prog & Committee Reports (Announcement Book)	3,700	7,800 (\$6,500 NCWM \$1,300 OWM surcharge)	4,440	12,440
<b>Total</b>	<b>9,750</b>	<b>\$18,480 (NCWM) \$1,300 (OWM)</b>	<b>\$14,974</b>	<b>\$34,954</b>

Summary		
Total Printing at NIST Expense	Total Postage at NIST Expense	Grand Total (Postage and Printing)
\$27,300	\$33,412	\$60,712
NCWM Printing Costs	NCWM	NCWM Total
\$18,480	-	\$18,480

In 1995, NCWM will pay the costs associated with membership invoicing (approximately \$11,000).

### 101-11 I Membership, Status Report



### 101-12 I Finances, Treasurer's Report

The actual income and expenses for 1993 are provided in Appendix B together with the 1994 and 1995 budgets. Some modifications were made to the 1994 budget to accommodate slight changes in priorities:

517.4, Video updates of H44/H130 were zeroed out and replaced with \$5,000 for the Education Committee to hold a special meeting to prepare a long-range management plan for the Education, Administration, and Consumer Affairs Committee; \$2000 was added to S&T budget for Solid Volume Measuring Devices (513.3) and deducted from the Interim Meeting costs (512).

#### *NTEP Maintenance Fee*

NTEP standards development will be covered by an NTEP Maintenance Fee approved by the NCWM in July 1993. Billing began October 1, and payments were due December 1. Fees not received by December 31 resulted in NTEP Certificates becoming inactive in 1994. An update to Publication 5 was produced at the end of January showing the status of all NTEP Certificates.

The Executive Committee determined that the NTEP maintenance fee will be devoted only to NTEP costs; an analysis of income for 1994 and expenses for 1993 was provided. \$104,000 in income was received for NTEP Certificate Maintenance.

#### *Participation of the Executive Secretary in Financial Management*

The Office of Weights and Measures designed and maintains for the NCWM an extensive database on weights and measures organizations and individuals, used for all mailings to members and nonmembers, including billing and offers of membership. The NCWM maintains a part-time cashier to accept and deposit checks. Acting as executive officer of the Conference, the Executive



## Executive Committee

Secretary manages the Conference administration and finances, certifying to the Treasurer the correctness of bills submitted to the Conference for payment. Questions have been raised about the level of fiduciary oversight necessary to protect the investment of the NCWM members. As the NCWM has grown to an annual budget of nearly \$300,000, the level of oversight and management by OWM desired by the NCWM should be clarified. In the continuing growth of the NCWM operation from a small organization to a large organization, a business manager and outside auditor should be considered.

**Committee Decisions:** Treasurer Gardner has obtained single signature authority on all NCWM accounts in New York. The Executive Secretary will advertise for a financial manager and internal auditor for the NCWM to verify accounts, bills, and income; issue checks to Treasurer; reconcile bank accounts; provide early warning and suggest opportunities for better fiscal management. This will be a part-time position, to be bid upon and finalized by contract.

### **101-13 I Finances, Associate Membership Fees**

A status report is contained in Appendix B. The Associate Membership Committee determined that it would underwrite part of the production of the Consumer Pamphlet with the surplus funds from 1993. The Chairman of the Associate Membership Committee, Chris Guay, announced at the 79th Annual Meeting that the Associate Membership Committee would underwrite 22 scholarships of \$500 each for training in the 1994-95 membership year. The \$11,000 provided by the Associate Membership Committee will be given to the Education Committee to manage.

### **101-14 I Finances, Auditing Committee**

The Auditing Committee now examines the NCWM finances and books at the Interim Meeting since this is the close to the end of the 1993 NCWM fiscal year. They reported to the Executive Committee that the books were in order for FY 1993.

### **101-15 I Meetings, Networking with Other Associations**

Much of the Committee's time during the Interim Meeting was spent in discussions with the new management at the National Institute of Standards and Technology. On Monday, the Executive Committee and 12 Associate members representing a wide array of both manufacturing and service businesses met with Mr. Ray Kammer, Deputy Director of NIST, and Dr. Peter Heydemann, Director of Technology Services, NIST. On Tuesday, all the standing committees and another ten associate members met with Dr. Arati Prabhakar, Director of NIST, and Dr. Heydemann. Both discussions centered around the essential services the NCWM provides businesses and industries, not just State and local weights and measures agencies. These services include maintenance of a fair marketplace nationally, minimizing unfair trade and measurement practices, and providing a single large geographic marketplace through national standardization of commercial trade practices. With more resources concentrated internationally, it may be possible to eliminate non-tariff trade barriers in foreign markets. Unfortunately, the pressing need to coordinate and leverage the contributions of all the business and regulatory agency participants within and outside the NCWM has exceeded the manpower resources of the NIST Office of Weights and Measures, which provides the secretariat of the NCWM. No fewer than 26 different working groups, subcommittee, task force, and other technical committee and sectors now actively meet on NCWM business. Even with the help of the Canadian Legal Metrology Branch, the Federal Grain Inspection Service, and all the States and businesses, central coordination is still essential. The same message was given when Associate members and Executive Committee members met with key Congressional staff on Wednesday of the Interim Meetings.

Congressional staff requested and received a one-page synopsis of needs, a "white paper" on the issues [ISO 9000, Mexico/NAFTA; OIML trade harmonization, training] and the OWM long range plan. These documents are available upon request. In addition, the NCWM requested the opportunity to testify before the House Appropriations Committee, which oversees NIST's budget.

## **101-16 I Meetings, Annual and Interim, Future**

### ***Interim Meeting, January 1995***

The 1995 Interim Meeting will be held at the Westin South Coast Plaza Hotel, 686 Anton Boulevard, Costa Mesa, CA 92626. Telephone 714-540-2500; Fax 714-662-6608. The dates are Sunday January 08, 1995 through Thursday January 12, 1995. The room rate is \$85 plus 6% tax.

San Antonio, New Orleans, and southern Florida will be explored for the 1996 Interim Meetings.

### ***80th NCWM***

The 80th Annual Meeting will be held at the Holiday Inn in Portland, Maine in 1995. Although the hotel is not large enough to book enough sleeping rooms so that all the Conference delegates can reside at the same location, another hotel to accommodate all delegate overflow is within walking distance. The main hotel is on the waterfront and part of the quaint city of Portland. Many restaurants and shops fill the streets. Fishing trawlers and other water craft moor in the busy harbor. The secondary hotel is within one block of the main hotel. The meeting location is close to our Canadian neighbors, so the Committee hopes to attract many business and weights and measures representatives from north of the border.

### ***81st Annual Meeting***

The location of the 1996 Annual Meeting must be carefully selected, since the Olympics are being hosted at that time in Atlanta, eliminating it as a potential site. The Executive Committee is considering Washington, DC, for 1996 if a hotel is available, and welcomes input from the Southern Weights and Measures Association for 1997 (and possibly 1996 if Washington is not available.)

## **101-17 I Program, OWM and NIST**

The OWM Long Range Plan was presented at the Interim Meeting. The Executive Secretary provided a status report on staffing that it can provide to the Conference. Dr. Edward Heffron, Director of the Food Division, MI Department of Agriculture, past Chairman of the NCWM, and recently a member of the NIST Visiting Committee, discussed the status of the National Institute of Standards and Technology and the Federal agency perspective under President Clinton's administration.

The Executive Committee and several Associate Members, under the leadership of Chairman Tom Geiler, focussed significant efforts on meeting with NIST management, Congressional Representatives and their staff, describing the work of weights and measures government to maintain a fair marketplace and the role of the NIST OWM in providing absolutely essential technical support to the individual jurisdictions and the NCWM. The efforts included a special meeting held for Dr. Peter Heydemann in Sacramento, CA, to brief him on the broad array of services for industry operated by California, and included meetings with Cardinal Scale and Procter and Gamble. A meeting with Neal Smith, D. IA, Chairman of the Appropriations Subcommittee over the NIST budget, in his home district, allowed weights and measures officials to describe the importance of the OWM to their programs. N. David Smith, NC, and W. Terry James, Cardinal Scale testified before the Appropriations Subcommittee at its budget hearings in Washington, DC. Several members of the Executive Committee and Associate members met with other key staff of Congressional representatives. This work has led to NIST Technology Services Director, Dr. Heydemann, increasing the OWM budget by a substantial amount. At the beginning of the fiscal year, OWM anticipated having to make staff cuts; by the end of the fiscal year, OWM expects to hire four new technical staff. Chairman Geiler recommends that the Executive Committee keep NIST and elected officials aware of the NCWM needs and issues, and establish a process for regular formal interaction with NIST.

## **101-18 I Program, International Organization of Legal Metrology**

The Executive Secretary wrote a memorandum to Dr. Sam Chappell requesting that he inform the International Bureau of Legal Metrology, Paris, that the National Type Evaluation Program is preparing to act as the Issuing Authority for nonautomatic weighing devices (OIML R76). See Item 102-6 for additional details.

The Executive Committee notes the reorganization of reporting structure of the Office of Weights and Measures and the Office of Standards Management (OIML). There is an increasing need for closer interaction with the Office of Standards Management, as the Conference acquires the capability to act as the Issuing Authority for OIML Certificates. The Executive Committee will explore the appropriate role of the NCWM and the NTEP and NIST Standards Management Program and OIML with the NIST management.

Dr. Chappell, NIST, updated the Committee on the work and plans of OIML as they affect the NCWM:

*International Committee of Legal Metrology (CML)*

The CML establishes the policy and approves the technical plans and work of the various OIML Technical Committees. Its 28th meeting was in Berlin, Germany from October 4-6, 1993. Representatives for 45 of the 51 member nations attended. The following significant reports and decisions were made at the meeting:

- New Structures. A report was presented on the new organizational structure with regard to establishing Technical Subcommittees (SCs) under the already approved Technical Committees (TCs). All TCs have been established; however, some of the associated SCs and allocated projects have not been finalized. It was requested that the structure and allocated projects be completed by the end of 1993. The following TCs have been assigned to the member nations indicated in parenthesis:
  - TC1 Terminology (Poland)
  - TC2 Units of Measurement (Austria)
  - TC3 Metrological Control (U.S.A.)
  - TC4 Calibration and Verification Devices (Republic of Slovakia)
  - TC5 Electronic Instruments (Netherlands)
  - TC6 Prepackaged Products (U.S.A.)
  - TC7 Measuring Instruments for Length and Associated Quantities (United Kingdom)
  - TC8 Instruments for Measuring Quantities of Fluids (Switzerland)
  - TC9 Instruments for Measuring Mass and Density (U.S.A.)
  - TC10 Instruments for Measuring Pressure, Force, and Related Quantities (U.S.A.)
  - TC11 Instruments for Measuring Temperature and Associated Quantities (Germany)
  - TC12 Instruments for Measuring Electrical Quantities (Germany)
  - TC13 Instruments for Measuring Acoustics and Vibration (Germany)
  - TC14 Measuring Instruments Used in Optics (Hungary)
  - TC15 Measuring Instruments for Ionizing Radiations (Russia)
  - TC16 Instruments for Measuring Pollutants (U.S.A.)
  - TC17 Instruments for Physico-chemical Measurements (Russia)
  - TC18 Medical Measuring Instruments (Germany)
- The Certificate System. An updated report was provided on the issuing authorities and the categories of measuring instruments included in the system. With regard to nonautomatic weighing instruments, 17 OIML Certificates have been issued: 13 by the Netherlands, 2 by Germany, 1 by the United Kingdom, and 1 by the People's Republic of China.
- Information. The OIML Bulletin has been redesigned. The combined September-December issue was distributed to members at the meeting. It will be issued quarterly. A brochure on OIML is under development and should be completed early next year.
- Long Term Policy. A report was provided on efforts of the President and Vice Presidents to develop a long term policy statement. A short version by Chappell and a long version by BIML were presented to members for comment by the end of 1993. The reports addressed new trends that appear to diminish the differences between legal and industrial, or ordinary practical, metrology. They also reflected the remarks presented by the delegates to the 1992 Conference of Legal Metrology on the subject.

*Decisions*

- Five new and revised OIML Recommendations were approved including the following:
  - Weights of Classes E<sub>1</sub>, E<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>, M<sub>1</sub>, M<sub>2</sub>, M<sub>3</sub>
  - Continuous Totalizing Automatic Weighing Instruments (Belt Weighers) (Revision of R50)



The United States was responsible for two of the Recommendations approved and had significant input in the others. BIML with a Nordic task group will prepare test procedures and a format of the test report for "Weights." A consideration for approval was postponed for "Format of Test Report" for R60 "Load Cells" which will be voted on by CIML by correspondence.

- Format of the Test Report. A resolution was passed that a format of the test report would be mandatory for a Recommendations to become a part of the OIML Certificate System but that the format was informative only for member nations regarding their adoption and harmonization of OIML Recommendations with national regulations. It was recommended that a model format for the test reports be prepared.
- It was agreed to hold the 29th meeting of CIML in Paris, France in October 1994.

#### *CIML Presidential Council*

The Presidential Council of CIML is its executive steering committee. It met February 10-11, 1994 in Paris, France. The principal items on the agenda were as follows:

- A review of the current technical work of the Technical Committees.
- A review of the status of the new organizational structures especially with regard to the commitment of member nations to collaborate as participating or observing members in the work of the various technical committees and their subcommittees.
- A discussion of the draft "Long Term policy of OIML."
- A review of the efforts to strengthen the communications efforts of BIML.

#### *Activities of OIML Secretariats*

This part of the report provides: (1) an identification of work, either Recommendations (Rs) or Documents (Ds), being developed in Technical Committees (TCs) and Technical Subcommittees (SCs) of specific interest to the NCWM and (2) a schedule of meetings of the International Working Groups (IWGs) of those committees that have been recently held or planned for the near future. More details of these activities have been reported by Otto Warnlof to the Specifications and Tolerances Committee of the NCWM.

- TC3/SC1 Pattern Evaluation and Verification (U.S.A.)

A second draft D "Initial Verification of Measuring Instruments Utilizing the Manufacturers Quality System" has been sent to TC3/SC1 for comment and vote. It will also be distributed to the Executive Committee for review.
- TC5 Electronic Instruments (The Netherlands)

A draft revision of D11 "General Requirements for Electronic Measuring Instruments" has been received from the secretariat for comment and vote.
- TC6 Prepackaged Products (U.S.A.)

A first draft revision of R79 "Information on Packaged Products" and of R87 "Net Contents in Packages" has been prepared by the secretariat and will be sent out for review and comment by collaborating member nations in 1994.
- TC8 Instruments for Measuring Quantities of Fluids (Switzerland)

A draft R "Characteristics of Standard Capacity Measures and Test Measures for Measuring Systems" was distributed to CIML for comment and vote. The U.S.A. voted yes without comments on June 15, 1994.

A draft R "Pipe Provers for Testing of Measuring Systems for Liquids" was distributed to CIML for comment and vote. The U.S.A. voted yes without comments on June 15, 1994.

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A draft R "Vortex Meters Used in Measuring Systems for Liquids" was distributed to CIML for comment and vote. The U.S.A. voted no with comments on June 15, 1994.

A draft OIML Document "Glass Delivery Measures: Automatic Pipettes" has been distributed to CIML for comment and vote by September 30, 1994.

### TC8/SC1 State Volume Measurement (France)

A draft revision of OIML R85 "Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks" has been distributed by the secretariat (the Netherlands) to the IWG for comment and vote by September 1, 1994.

### TC8/SC2 "Direct Static Mass Measurement of Quantities of Liquids" (Australia)

The secretariat prepared a fourth draft R "Direct Mass Measuring Systems for Quantities of Liquids" for comment and vote by the IWG. The U.S.A. voted yes with comments 02/01/94.

### TC8/SC3 Dynamic Volume Measurement (Germany and France)

A first draft R "Measuring Systems for Liquids Other than Water" was distributed by the secretariat for comment and vote at the TC level. This draft combines R5, R27, R57, R67, and R77 (Volume Meters, Ancillary Equipment, General Provisions, Particular Assemblies, and Metrological Controls, respectively). The U.S.A. voted no with comments mainly concerning design criteria for electronics and air eliminators.

A draft R "Testing Procedures for Pattern Evaluation of Fuel Dispensers for Motor Vehicles" was distributed to CIML for comment and vote. The U.S.A. voted yes without comments on June 15, 1994.

### TS8/SC4 Dynamic Mass Measurement (U.S.A.)

A format of the test report for R105 "Direct Mass Flow Measuring Assemblies for Quantities of Liquids" was developed. The secretariat responded to comments by IWG and submitted a final draft for CIML vote on March 24, 1994.

### TS8/SC5 Water Meters (United Kingdom)

The secretariat submitted a draft revision of R49 "Water Meters intended for Metering of Cold Water" to CIML for comment and vote. The U.S.A. voted no with comments on March 15, 1994.

### TC8/SC6 Measurement of Cryogenic Liquids (U.S.A.)

A NWG met from June 8-9, 1994 to develop a revised draft for OIML R81 "Measuring Devices and Systems for Cryogenic Liquids." A draft revision has been completed and is being reviewed by the NWG.

### TC8/SC8 Gas Meters (Netherlands)

A draft revision of R31 "Diaphragm Gas Meters" was distributed to CIML for comment and vote. The U.S.A. voted yes without comments on July 8, 1994.

### TC9 Instruments for Measuring Mass and Density (U.S.A.)

A draft revision of R74 on "General Requirements for Electronic Measuring Instruments," sanctioned by the 9th Conference, is being revised further with regard to reference to "checking facilities."

A format of the test report for R60 "Load Cells" was approved by CIML at its last meeting. This Recommendation, therefore, is now within the OIML "Certificate System," and some member nations are now prepared to issue OIML Certificates.

A meeting of the IWG for TC9 was held in conjunction with TC9/SC2 in Teddington, U.K. May 30 - June 2, 1994. The organization of the TC, revisions of R60 and R74, test procedures and report forms for R111 "Weights," and the responsibility for SC4 "Densities" were discussed.

#### TC9/SC1 "Nonautomatic Weighing Instruments" (Germany and France)

A draft revision of R76 Part 1 on "Nonautomatic Weighing Instruments" including test procedures was sanctioned by the 9th Conference, and Part 2 including the format of the test report was approved by CIML by correspondence in 1993.

Proposed amendments to OIML R76-1 were distributed by the secretariat to the IWG for comment and vote. The U.S.A. voted yes without comments on April 30, 1994.

It was announced that the U.S.A. would become an issuing authority for OIML Certificates of conformance of nonautomatic weighing instruments to OIML R76 through the NCWM (NTEP) in March 1994.

#### TC9/SC2 "Automatic Weighing Instruments" (United Kingdom)

A sixth CD revision of R51 on "Checkweighing and Weight Grading Machines" including test procedures and report forms was distributed to the IWG for vote. The U.S.A. voted no with comments on May 5, 1994.

A seventh CD revision of R61 on "Automatic Gravimetric Filling Machines (Hoppers)" including test procedures and report forms was distributed to the IWG for vote. The U.S.A. voted no with comments at the IWG meeting from May 31 - June 2, 1994.

A draft revision of R106 "Automatic Rail Weighbridges" including test procedures and a report form was distributed to the IWG for vote. The U.S.A. voted no with comments.

A draft revision of R107 "Discontinuous Totalizing Automatic Instruments (Totalizing Hopper Weighers)" including test procedures and a report form was distributed to the IWG for vote. The U.S.A. voted yes with comments on January 14, 1994.

All of these drafts were discussed at a meeting of TC9/SC2 in Teddington, U.K. May 31 - June 3, 1994. The next IWG meeting is scheduled for the same location in December 1994.

#### TC9/SC3 "Weights" (U.S.A.)

The Recommendation on "Weights of Classes E1, E2, F1, F2, M1, M2, and M3" was approved by CIML at its last meeting and has been published as R111.

## Part II - NTEP Board of Governors

### 102-1 I Policy, NTEP Name and Logo

Guidelines for the use of the NTEP name and logo are needed to protect the integrity of NTEP and eliminate false or misleading advertising invoking or implying NTEP certification. A policy, drafted by Mettler-Toledo at the request of the Board of Governors and revised in time for the 79th Annual Meeting, was reviewed by the Scale Manufacturers Association NTEP Integrity Committee, but not endorsed. The Scale Manufacturers Association recommends that the NCWM register the National Type Evaluation Program logo as a registered trademark.

The Board endorses the general principles and guidelines of fair marketing embodied in the draft. It is proposed to be incorporated into NCWM Publication 14, containing NTEP Policy. The proposal would require an officer of a company holding a Certificate of Conformance to sign an annual advertising agreement with NTEP. This is in line with the practices of such organizations as

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Underwriters Laboratories, Factory Mutual, ISO, and others. Mettler-Toledo provided examples only in the weighing device field. They recommend that the motor fuel dispenser and metering manufacturers review and provide examples suitable for their industry.

The Board appreciates the work of Mettler-Toledo in providing the first draft for NTEP policy, printed below.

Replace Paragraph Q. References to NTEP in NCWM Publication 14 with the following:

### Q. References To NTEP

#### 2. Permissible Use of Statements and NTEP Logo

##### a. The Manufacturer

Prior to the issuance of a device manufacturer's first Certificate of Conformance and annually at the time of renewal, the manufacturer shall execute an Advertising Agreement with NTEP. The Advertising Agreement shall be signed by an officer of the company attesting that the NTEP Advertising Guidelines, a copy of which will be attached to the Advertising Agreement, have been read and understood and that the manufacturer agrees to abide by them.

Prior to using the NTEP name and logo, the device manufacturer shall have paid all fees required for issuing the initial certification document, including those required by the servicing laboratory that conducted the test. A manufacturer who fails to pay the annual maintenance fee for a certificate within 30 days after billing will forfeit the right to use the NTEP name and logo for devices covered by that certificate.

The NCWM and the NTEP do not approve, endorse, or sponsor the products that are being or have been evaluated. Any information issued by the manufacturer which states or implies approval, endorsement, or sponsorship are in violation of these guidelines and may cause revocation of the Certificate of Conformance applicable to the product.

The NTEP name and/or logo shall not be used in conjunction with a device that has not been certified. Use of the name and/or logo with respect to NTEP certified component(s) is not permitted if the device that contains the component(s) (e.g., load cell, indicator, platform) is not certified but could be certifiable based on Handbook 44 and these Guidelines. The NTEP logo may be used only in conjunction with products that have been certified in accordance with this publication and Handbook 44. The logo should never be used in any manner that might suggest or imply that certification extends to a product that is not NTEP-certified. Where reference is made to NTEP, it is essential to clearly identify which products are NTEP-certified if the copy also includes products that are not certified. References to NTEP must always be located in close proximity to any reference to a certified product when uncertified products are shown on the same page.

Descriptive text accompanying the logo shall, at a minimum, contain the certified model number or designation, accuracy class, and the NTEP Certificate of Conformance number applicable to the device represented. Acceptable examples of this are shown in Annex A.

In the event that a Certificate of Conformance is withdrawn and/or canceled, the device manufacturer immediately forfeits the right to use the NTEP name and/or logo for that product, literature, manuals, packaging, or other promotional items relating to that product's CC.

In addition, the NTEP Board of Governors may suspend, withdraw, or cancel the device manufacturer's right to use the NTEP logo and/or name if the manufacturer is found out of conformance with the NTEP Advertising Guidelines and if, after notification, does not in a timely fashion correct the non-conformance. Improper references to NTEP may require revision of the advertising or packaging materials and/or destruction of existing stocks of these materials. Repeated violations of these guidelines may result in the revocation of all Certificates of Conformance held by the manufacturer.

In the event the applicant for a Certificate of Conformance is not the manufacturer of the device, all references to "manufacturer" cited above will apply to the applicant as if he were the manufacturer.

## Annex A

### Specific Guidelines For Use Of The NTEP Logo

The NTEP logo shall never be used on printed literature, manuals, packaging, or promotional items without the appropriate descriptive explanation of what is covered in the device certification. The logo and descriptive explanation shall be clearly differentiated from other information by use of border lines or paragraph breaks. Headers or titles prior to the logo and descriptive statement are acceptable, including: "Certificate of Conformance", "NTEP Certified", "Accuracy", "Legal For Trade", "Designed For Commercial Use", et cetera.

The NTEP logo may be used in video and/or audio materials without this same visual descriptive explanation of what is covered in the device certification. In these cases, certificate explanation may be made via audio or visual media. Content, however, must still conform to the guidelines listed in Article Q.2.a and this appendix.

The NTEP logo may be used on the device manufacturer's product only if it is in the proximity of, and can be seen with, the device manufacturer's product data tag. In order to use the NTEP logo on the product, the visible data tag must include all of the information required by Handbook 44.

Descriptive text which accompanies the logo shall, at a minimum, contain the certified model number or designation, accuracy class, and the NTEP Certificate of Conformance number applicable to the device represented. Acceptable examples of this are shown below:

#### Truck Scale

The Model XXXX Truck Scale meets or exceeds Class III L, 10,000 division accuracy requirements in accordance with the National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures.

#### Floor Scale

The Model XXXX Floor Scale meets or exceeds Class III, 5000 division accuracy requirements in accordance with the National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures.

#### Indicating Element

The Model XXXX Weight Indicator meets or exceeds Class II, 60,000 division and Class III/III L, 10,000 division accuracy requirements in accordance with the National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures.

#### Load Cell

The Model XXXX Load cell meets or exceeds Class III L, 10,000 division accuracy requirements in accordance with the National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures. The Certificate of Conformance specifies the maximum number of scale divisions ( $n_{MAX}$ ), load cell verification interval ( $v_{MIN}$ ), and capacities for the Model XXXX load cell family.

Sometimes a product will have only limited Certification due to size, capacity, functionality or other restrictions. If the device manufacturer desires to sell or publicize versions which have not been certified, the NTEP name or logo may be used without appropriate clarification. Noncertified versions must be clearly marked as "Not NTEP Certified," or a statement such as the following will be included:



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The Model XXXX Floor Scale meets or exceeds Class III, 5,000 division accuracy requirements, in accordance with the National Institute of Standards and Technology (NIST) Handbook 44 for 1,000 through 10,000 pound capacities, 3' x 3' through 5' X 7' platform sizes, inclusive. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures.

Specific logo specifications are available upon request, in writing from:

NTEP Board of Governors  
National Conference on Weights and Measures  
P.O. Box 4025  
Gaithersburg, Maryland 20885

### 102-2 I Program, Verification that Production Meets Type

The Board believes that a more rigorous system is needed to ensure that production devices and components match the original types. The original intent was State enforcement agencies to provide such assurance. Publication 14, Subpart K.2. Feedback reads:

The evaluation process under NTEP can generate only limited data. The data gathered during the initial and subsequent verifications of a larger number of devices of a given type will, when systematically analyzed, often yield information not available from the type evaluation. Such feedback can be used as the basis for revising the conditions of approval when the situation so warrants.

Depending on circumstances, experience gained during verifications may justify later changes in the Certificate of Conformance; in extreme cases, it may dictate reevaluation of the type.

The Board of Governors discussed what action should be taken to monitor the compliance of both scales and load cells in production with the influence factors requirements. It was agreed that compliance with the influence factor requirements cannot be determined by ordinary field enforcement testing. There were reports that some devices in the field do not match the designs and performance (even at ambient temperature) of those devices given NTEP CCs. At the 78th Annual Meeting in July 1993, the Board preliminarily decided to transmit its concern to all jurisdictions that commercial floor scales (particularly those with 5000 scale divisions) may not meet type (particularly with respect to accuracy), and to request that thorough performance testing be conducted at ambient temperature during field inspections. Testing the devices to full capacity was going to be reinforced. Jurisdictions were going to be asked to transmit their findings to the NTEP Board of Governors, for consideration and action.

#### *Production Device Evaluation in Environmental Chambers*

Since then, a Board member has observed tests on floor scales from production inventories of several manufacturers. His data, shared with the Board, is presented in Appendix C. Seven of eight tested scales failed to meet requirements; such results challenge the integrity of NTEP. The Board of Governors feels that a Certificate should be withdrawn when production devices do not match type. Unfortunately, many of the scales would comply with Handbook 44 at room temperature, and most failed at low temperature, indicating the difficulty of determining full compliance in the field. Jim Truex's recommendations for changes to Publication 14 and NTEP Policy are presented for information below with the intent to adopt policy for production devices in 1995.

**Proposal:** To establish NTEP policy for cases where NTEP or field inspection and testing indicates that production devices do not match the original type evaluated by NTEP.

Amend Section M.6. of NTEP Administrative Procedures (Pub 14) to read:

#### 6. Post-Evaluation Responsibility Of Manufacturer

As a result of requesting an evaluation and accepting the Certificate of Conformance, the manufacturer implicitly asserts that all devices manufactured as the type referenced in the Certificate of Conformance are the same type.

Questions regarding the conformance of manufactured devices to the "type" for which a Certificate of Conformance was issued will be addressed using the existing verification system based on the following premises:

1. ~~existing NTEP policies are sufficient to address production devices;~~
2. ~~NTEP is limited to the initial type evaluation of devices;~~
3. the field enforcement process is responsible for ensuring that production devices comply with Handbook 44 and match the original type; and
2. NTEP is responsible for ensuring that production devices comply with Handbook 44 and match the original type when circumstances are convenient for inspection and testing;
3. service technicians, service agencies, manufacturers and other industry may report to NTEP that production devices do not comply with Handbook 44 or match the original type; however, in these cases, noncompliance must be verified by NTEP prior to action by the Board of Governors;
4. if the field verification process or NTEP reveals a history of abnormally high device failure, or production devices do not comply with Handbook 44, or production devices do not meet type, this information may be used in withdrawing a Certificate of Conformance for cause; and
5. prior to withdrawal of the Certificate of Conformance, the manufacturer will be notified and given the opportunity to show that production devices meet type in one or more of the ways described below.
  - (a) By submitting a production device or devices to NTEP for reevaluation.
  - (b) By submitting adequate information and data to NTEP to show that the quality assurance procedures in place in their company show compliance with Handbook 44 and that production meets type.

Justification:

The integrity of NTEP and NTEP Certificates of Conformance is being challenged. States report deficiencies in installed devices with CCs. Manufacturers report noncompliance of competitors' devices to Handbook 44. NTEP labs have come across devices and main elements that differ from the original type. NTEP must establish a means of evaluating production devices to ensure that production meets type. It would be difficult, mainly due to lack of NTEP funding, to reevaluate all models traceable to an NTEP CC. However, it appears that NTEP should at least reevaluate suspect models to preserve the integrity of NTEP.

Reasons For:

1. There are cases where production does not match type.
2. Evaluating production models will improve NTEP and the integrity of NTEP.
3. Evaluating production should improve the quality assurance procedures of many manufacturers.

Reasons Against:

1. NTEP and manufacturers will have to bear costs.

*Should NTEP Consider Production Quality Assurance Data or In-Plant Sampling and Testing?*

To augment field verification, the Board discussed other approaches to verifying that production meets type. One possibility is voluntary cooperation by manufacturers, with in-plant inspection visits by NTEP. Some manufacturers will cooperate with this approach but not all are in favor. Other conformity assessment organizations, such as Factory Mutual (FM) and Underwriters



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Laboratory (UL), have contractual procedures in place to sample from manufacturers' products to determine that production complies with type; NCWM could develop similar procedures. John Robecek, Vice President, Mettler-Toledo, presented mathematical information suggesting that a totally independent sample of two production devices could indicate within 95 % confidence that, if both failed type evaluation tests, the production devices do not match type.

The cost of sampling and testing production devices is of great concern to the Board. Estimated costs will have to be developed to determine the role of voluntary sampling, or whether mandatory testing, similar to UL or FM contracts, might have to be considered.

### **102-3 I Policy, Clarification of When Remanufacturers Must Obtain and Maintain an NTEP CC**

The Open Hearing of the Executive Committee at the 78th Annual Meeting considered a question of applying maintenance fees to "remanufactured" devices. It was answered on the floor and in the Executive Committee report that "remanufactured" devices are subject to a maintenance fee if the remanufacturer intends to continue to remanufacture the device to which the CC applies.

Mr. Richard Tucker of Tokheim later wrote to the Executive Secretary for further clarification. Tokheim offers exchange equipment if a customer's equipment is deemed unserviceable in the field. Equipment may also be replaced due to the cost of repair or the time needed to get the unit operational. If replaced, the unit is brought back to the manufacturer, remanufactured, and put on an exchange list. The remanufactured equipment is not necessarily returned to the original owner. The Board was consulted as to what constitutes a "remanufactured" device.

One possible solution is to define "remanufactured" based on whether the device is sold after remanufacture for installation at a new location, not in exchange for an identical model. If a device needing repair is replaced by an equivalent device, this might be considered repair, not remanufacture. This interpretation considers that a repair could be made either on site or later at the factory. Not all members of the Board agreed with this interpretation. Two members suggested that the only clear way for such a device replacement to become a "repair" would be if the manufacturer brought the original device back after repair at the factory. One jurisdiction, for the convenience of its field inspectors, has defined remanufactured devices as those whose serial numbers have changed. Another Board member suggested that narrow definitions of what constitutes repair require manufacturers to bear unnecessary costs. The Board determined that any device refurbished, rebuilt, or having any major component rebuilt or replaced would be considered remanufactured if it were sold for installation in a new location; an active CC must be maintained in this case. The Board did not want to constrain a repair to have to be made in the field, however.

Another point of discussion was the amount of refurbishing to consider a device not just repaired, but remanufactured. The Measuring Sector had advised the NCWM last year that the sector members also disagreed on the definition of remanufactured devices: three possible definitions were (1) those devices that are completely overhauled; (2) those having at least a major component rebuilt or replaced; or (3) when other than the original equipment manufacturer (OEM) or authorized representative rebuilds or replaces major components or completely overhauls the device. If a device is not removed from the field for replacement of components, or if a device is rebuilt by other than the OEM and replaced in the same installation, there is no way for a field inspector who has been told to observe changes in the serial numbers to detect these "remanufactured" devices since the serial numbers will not have been changed. Thus, it appears to be prejudicial to define devices that have been repaired earlier and switched with those needing repair (because they will have different serial numbers) as "remanufactured" when it is the repair method of choice of some OEMs. This item is related to 102-12 concerning policy for repaired and remanufactured scales. Unlike scales, individual components of metering systems do not have to be marked. The Board will determine the extent of this problem to the OEMs and to the weights and measures agencies in order to determine the priority to be placed on resolving the issues associated with remanufacture.

### **102-4 I Program, Acceptance by the States**

Daryl Tonini, Scale Manufacturers Association (SMA), updated the Board of Governors on the status of its drive to assist States to adopt the Uniform Regulation for National Type Evaluation and the Uniform Regulation for the Voluntary Registration of Service Persons and Service Agencies. SMA's program will continue into the coming year. At the time of publication of this report, Alabama, Arizona, Arkansas, California, Connecticut, Georgia, Hawaii, Idaho, Illinois, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina,

Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Utah, Virginia, West Virginia, and Wyoming have adopted type evaluation requirements or recognize the National Type Evaluation Program Certificates of Conformance. Alaska, Florida, Minnesota, New Mexico, Nevada, South Carolina, and Washington are in the process of recommending that NTEP Certificates be required.

## 102-5 I Uniform Regulation for National Type Evaluation

The Laws and Regulations Committee was asked to incorporate the administrative policy recommended by the Board of Governors and NTEP Technical Sectors into an expanded version of the Uniform Regulation for National Type Evaluation. Such expansion will require further development of consensus concerning the policies a State should follow as to requiring a CC for resale of a used device, how to define and test devices that are declared by the manufacturer to be one-of-a-kind, and how to determine whether a remanufactured device has been evaluated. See the Laws and Regulations Committee report for the draft regulation.

## 102-6 I Program, OIML Certification Plan

### *Reciprocity*

In the spring of 1993, the National Type Evaluation Program (NTEP) was contacted by a scale manufacturer to determine whether NTEP would accept data from an International Organization of Legal Metrology (OIML) Certificate in lieu of NTEP testing the scale. The scale company requested recognition of this test data since both the United States and the nation that issued the OIML Certificate were treaty members of the OIML and since the scale had been evaluated against the same performance criteria under the OIML standards as under Handbook 44.

NTEP Policy as to accepting data from other nations requires reciprocity by those other nations (that is, the other nations will accept NTEP data):

"NTEP would not accept a certificate from another country as the basis for issuing an NTEP certificate. The basis of the decision was that there is no formal agreement among countries to accept each other's certificates....The discussions on accepting data from a national laboratory focussed on whether or not the [load cell] manufacturer had access to test equipment to monitor production and the need for reciprocity between countries before accepting data from another national laboratory as a basis for issuing a full Certificate of Conformance."(Page 136, Report of the 76th National Conference on Weights and Measures, 1991, Weighing Sector Report of 1989.)

In an exchange of letters, the nation that issued the OIML Certificate agreed to accept an OIML Certificate issued by the United States.

Since the above NTEP policy was enunciated before there was an OIML Certificate System, the NCWM and NTEP decided to revisit this issue. A "straw poll" of the Executive Committee and the National Type Evaluation Technical Committee was conducted by the Executive Secretary in anticipation of a meeting of the NTEP Board of Governors at the Annual Meeting. That meeting was held July 18. The Executive Committee discussed the fact that correspondence from the other nation referred to a U.S. OIML certificate. Unfortunately, reciprocity could not be tested since NTEP has not issued an OIML Certificate.

At the 78th Annual Meeting, 1993, the NTEP Board of Governors decided to concentrate NCWM resources on the U.S.-Canadian Mutual Recognition work as a foundation for future issuance of an OIML Certificate by the U.S. The Board also stated that NTEP was not prepared at that time to accept OIML certificate test results as a substitute for NTEP evaluation without satisfying U.S. businesses that OIML Certificates issued by the U.S. will be accepted by other nations.

At the 1994 Interim Meeting, however, the Scale Manufacturers Association and individual companies including liquid metering device manufacturers, spoke strongly in favor of moving ahead and asked NTEP to issue an OIML Certificate. The industry position is that NTEP should seek to become the Issuing Authority for OIML for Non-automatic Weighing Devices (R 76.) as soon as feasible.

Board members who also operate NTEP Participating Laboratories and are familiar with the OIML R76 standard expressed concern about (1) the learning curve to duplicate the OIML test sequence when they are already devoting a great deal of their time becoming

## Executive Committee

familiar with Canadian tests; (2) reporting the data in the correct format; (3) meeting ISO 25 criteria within their own laboratories; and, (4) obtaining parts of the OIML tests by private laboratories that also meet the ISO 25 criteria for laboratories. Otto Warnlof, Standards Management Program, NIST, said that he would provide technical assistance to the NCWM and NTEP with respect to items (1) and (2) that he would assist in locating a laboratory capable of performing tests that NTEP Participating Laboratories are not equipped to do. The Executive Secretary will pursue Participating Laboratory conformance with ISO Guide 25 by means of contract with an outside consultant.

### 102-7 I Program, NTETC Sectors on Grain Moisture Meters and Protein Analyzers

A report of the progress of these sectors was given by Dr. Richard Pierce, the Technical Advisor from the U.S. Department of Agriculture, Federal Grain Inspection Service.

The Committee also discussed progress on the issue of how to support an ongoing calibration monitoring program required for grain moisture meters.

In the scheme devised by the sector, type evaluation of grain moisture meters will take place in two phases. Phase I tests will include examination of the submitted device against "basic instrument" tests (including the current requirements as well as the proposed specification and user requirements, which require the automatic display of moisture content results) and a test of the calibration of the device over a limited range of grains and moisture content. Successful completion of Phase I will qualify the meter as eligible for enrollment in Phase II, the National Calibration Program. Phase II will be required to maintain the Certificate of Conformance (CC) and permit the continued use of the meter in commercial grain exchange. Phase II will also be used to add grains to a CC for a particular meter. Therefore, the calibration status of a given meter will be indicated on the CC by a listing of the specific grains and moisture content ranges along with a designation of "approved," "pending approval," or "not approved" for each range.

The costs of Phase I are intended to be covered entirely by the meter manufacturer (estimated at about \$6000-7000 per meter). After the type evaluation has been completed, the accuracy of the moisture measurement over the lifetime of the meter depends on its calibration over its lifetime routinely using a wide variety and range of moisture content of actual grain samples. The annual cost of Phase II will be double the one-time cost of Phase I for any given model of moisture meter (about \$12,000-13,000 per meter for 16 grain types). Chairman Geiler, Sid Colbrook, IL, and Tom O'Connor, National Grain and Feed Association, met with staff of Senator Daschle (D, ND) during the Interim Meeting to discuss alternative funding approaches. A meeting was held with representatives of the grain industry November 30 in Kansas City on this subject; all agreed that Federal funding was the lowest cost approach for the Nation.

FGIS is now authorized as a Participating Laboratory for the evaluation of grain moisture meters and has accepted grain moisture meters to be evaluated under Phase I of the type evaluation program. At the present time, FGIS and NIST have agreed to set up an Interagency Agreement with meter manufacturers to participate in Phase II of the NTEP evaluations, to provide calibration data from a national sample pool to the meter manufacturers.

FGIS is prepared to seek authorization as a Participating Laboratory for Protein Analyzers if the Conference adopts a tentative code for Near Infrared Grain Analyzers at this Annual Meeting. They expect to be able to offer type evaluation at the beginning of 1995.

### 102-8 I Program, Participating Laboratories/Evaluation Report

A report on the NTEP Participating Laboratories was given, including their workload and planning for addition of capabilities to conduct evaluations.

#### New NTEP Participating Laboratories and Field Evaluation Sites

Nebraska  
Type Evaluate  
Bulk Weighers  
Field/Permanence Tests  
Medium Capacity Scales  
Large Capacity Scales

**Federal Grain Inspection Service**

Type Evaluate  
Grain Moisture Meters

**New Capabilities in Existing  
NTEP Participating Laboratories**

**California**

Type Evaluate  
Load Cells (Including Influence Factors)

**Maryland**

Type Evaluate  
All Liquid Measuring Devices  
Indicators/Cash Registers for Liquid Measuring Devices

**North Carolina**

Type Evaluate  
All Liquid Measuring Devices  
Indicators/Cash Registers for Liquid Measuring Devices

**New York**

Type Evaluate  
Taximeters

- 1994 Objectives
1. Implement the U.S./Canadian Mutual Recognition Program in April.
  2. Publish Pub 5 in January, including all CCs since May 1, 1993.
  3. Publish Pub 5 updates in May and September including CCs since the previous edition.
  4. Provide updated Pub 5 index, a list of inactive CCs, and a list of one-of-a-kind devices, monthly on computer bulletin board indicating new CCs.
  5. Improve NTEP management data to allow more accurate analysis and improve NTEP customer satisfaction.
  6. Add more participating Laboratory capability.

### Authorized Areas of Evaluation By U.S. Participating Laboratories

FG = Force Group    FGIS = Federal Grain    HO = H. Oppermann    RW = R. Whipple    TB = T. Bucher    TG = T. Grimes    AL = Alabama  
 CA = California    OR = Oregon    MD = Maryland    NC = N. Carolina    NY = New York    OH = Ohio    NE = Nebraska

Action Description	AL	CA	FG	FGIS	HO	MD	NC	NE	NY	OH	OR	RW	TB	TG
Type Evaluate All General Purpose Scales <sup>1</sup>		X			X	X			X	X			X	
Type Evaluate All Measuring Devices <sup>1</sup>		X			X	X	X					X	X	
Type Evaluate Indicators/ECR's with Scales <sup>1</sup>			X			X			X	X			X	
Type Evaluate Indicators/ECR's with Measuring Devices <sup>1</sup>		X			X	X	X					X	X	
Type Evaluate Bulk Weighing Scales <sup>1</sup>					X	X		X						
Type Evaluate Belt Conveyor Scales <sup>1</sup>					X	X			X			X	X	
Type Evaluate Taximeters		X							X					
Test Load Cells (Inc. Influence Factors)		X	X											
Perform Influence Factor Testing						X			X	X				
Field/Perm Test Medium Capacity Scales		X			X	X		X	X	X	X		X	
Field/Perm Test Large Capacity Scales	X	X			X	X		X	X	X	X		X	
Field/Perm Test Railroad Track Scales				X	X									
Field/Perm Test Bulk Weighing Scales		X		X	X			X						
Field/Perm Test Belt Conveyor Scales	X	X			X	X			X			X		
Field/Perm Test All Measuring Devices		X				X	X		X			X	X	
Field/Perm Test Indicators with Measuring Devices		X			X	X	X		X	X		X	X	
Add models to Certificates of Conformance		X			X	X			X			X	X	X
Cross Reference Products Between Certificates of Conformance		X			X	X						X	X	X
Make Corrections to Certificates of Conformance					X							X	X	X

<sup>1</sup> Type evaluate and generate Certificates of Conformance but may include Field/Perm testing by other authorized laboratories.



National Type Evaluation Program Status Report				December 29, 1993	
Activity	CA	MD	NY	OH	NIST
Requests Assigned					
1992	49	22	15	69	141
1993	65	24	21	60	134
New Type Evaluations	50	23	20	54	40
Updated Type Evaluations	15	1	1	6	103
Certificates Effective <sup>1</sup>					
1992	7	3	3	11	59
1993	8	5	4	4	14
New Type Evaluations	6	5	4	4	2
Updated Type Evaluations	2	-	-	-	12
Certificates Issued					
1992	79	16	18	84	100
1993	42	11	15	38	131
New Type Evaluations	29	11	14	36	29
Updated Type Evaluations	13	-	1	2	102
Assignments Not Completed					
1992	30	14	12	21	30
1993	50	24	13	50	40
New Type Evaluations	46	23	13	46	27
Updated Type Evaluations	4	1	-	4	13
Average Time (weeks) - Assigned Date to Effective Date - All Labs <sup>2</sup>					
1992	14				
1993	15				
New Type Evaluations	19				
Updated Type Evaluations	10				
Average Time (weeks) - Effective Date to Issue Date - All Labs <sup>3</sup>					
1992	10				
1993	12				
New Type Evaluations	11				
Updated Type Evaluations	9				

<sup>1</sup> "Effective" means the type evaluation is complete but the certificate has not yet been generated and issued.

<sup>2</sup> Time, in weeks, from when the request was assigned to a lab to when the actual type evaluation was completed.

<sup>3</sup> Time, in weeks, from when the type evaluation was complete to when the certificate was generated and issued.

Why weren't the average times reduced in 1993?

1. Since 1992, 97 new companies have requested type evaluations. This caused a higher type evaluation failure rate, and led to a higher number of type evaluations in process and fewer CCs in 1993. Also, multiple failures of a single device have been grouped together leading to longer average times to complete a type evaluation.
2. A quality review for CCs was added in 1993 to insure more consistency and completeness of CCs. This has led to longer average times to issue a CC.

What can be done about it?

1. More confidence in the NTEP program and a quicker reaction time by OWM to respond to inquiries and needs has prevented items 1 and 2 above from creating major problems.
2. A system needs to be developed to keep track of failed type evaluations and begin the cycle over when the device is resubmitted. This would provide more valid type evaluation cycles.

3. More data is needed to assist the Labs and NIST to evaluate and reduce turn-around times.

Participating Laboratories Evaluation		December 29, 1993		
All Labs	1992 CCs	1993 CCs	1993 TEs	1993 Other
Requests Assigned	296	313	187	126
Certificates Effective	83	35	21	14
Certificates Issued	297	237	119	118
Assignments Not Complete	110	177	155	22
Average Time (weeks) Date Assigned To Effective Date	14	15	19	10
Average Time (weeks) Effective Date To Issue Date	10	12	11	9
Total Time (weeks) Date Assigned To Issue Date	24	27	30	19

#### U.S./Canadian Mutual Recognition Program

1. First Meeting held in April, 1993
2. Technical representatives met in June 1993.
3. Initial device types to be type evaluated by either country
  - electronic non-computing bench and platform scales or separate weighing elements with a capacity up to 500 kg
  - electronic indicators for use with weighing scales
4. Training on the Canadian process held in September, 1993
5. Training on the U.S. process held in February, 1994
6. Program was implemented in April 1994
7. Into which new areas do we expand?

#### 1994 Results

1. Published Pub 5 in January including all CCs for the previous year.
2. Published Pub 5 update in May including all CCs since the previous edition; another is scheduled for September.
3. Improved bulletin board performance including a Pub 5 index updated monthly identifying new CCs and a listing of inactive CCs.
4. Implemented the U.S./Canadian Mutual Recognition Program in April.
5. Improved the content of NTEP management data to allow more accurate analysis and improved NTEP customer satisfaction.
6. Added more Participating Laboratory capability.



National Type Evaluation Program Status Report							July 5, 1994
Activity	CA	MD	NY	OH	NIST	OTHER	TOTAL
<b>Number of Requests Assigned<sup>1</sup></b>							
1992	49	22	15	69	141	--	296
1993	65	24	21	69	134	--	304
New Type Evaluations	50	23	20	54	40	--	187
Updated Type Evaluations	15	1	1	6	94	--	117
1994	57	19	12	50	48	11	197
New Type Evaluations (including Mutual Recognition TEs)	52	19	11	49	11	11	153
Mutual Recognition TEs <sup>3</sup>	--	--	1	8	37	1	7
Updated Type Evaluations	8	--	1	4	37	--	44
<b>Number of Certificates Effective<sup>2</sup></b>							
1992	7	3	3	11	59	--	83
1993	8	6	1	4	14	--	35
New Type Evaluations	6	5	4	4	2	--	21
Updated Type Evaluations	2	--	--	--	12	--	14
1994	8	6	4	4	18	--	42
New Type Evaluations	7	6	1	4	1	--	22
Updated Type Evaluations	1	--	--	2	17	--	20
<b>Number of Certificates Issued</b>							
1992	79	16	18	84	100	--	297
1993	42	11	15	38	131	--	237
New Type Evaluations	29	11	14	38	29	--	119
Updated Type Evaluations	13	--	1	2	102	--	118
1994	30	2	15	15	39	--	101
New Type Evaluations	21	2	14	13	11	--	61
Updated Type Evaluations	9	--	1	2	28	--	40
<b>Number of Assignments Not Completed</b>							
1992	30	14	12	21	30	--	107
1994	50	24	13	50	30	--	177
New Type Evaluations	46	23	13	46	28	--	155
Updated Type Evaluations	4	1	--	4	18	--	22
1994	34	16	1	38	30	11	135
New Type Evaluations	33	16	6	37	7	11	110
Updated Type Evaluations	1	--	--	1	23	--	25
<b>Number of Assignments Withdrawn</b>							
1994	--	4	--	--	--	--	4

<sup>1</sup> Beginning in 1994, if a device fails a type evaluation, it is then entered as a new request for a new type evaluation.

Previous to 1994, multiple failures of the same device were still considered as a single type evaluation.

<sup>2</sup> "Effective" means the type evaluation is complete but the certificate has not yet been issued.<sup>3</sup> Included in total of 1994 New Type Evaluations

## **102-9 I NTETC Weighing, Measuring, and Belt-Conveyor Scale Sector Reports**

The Board was updated on the status of the work of each of these sectors and the work groups under the Weighing Sector. Their reports, available upon request to the Office of Weights and Measures, are published as part of the final report of the Board of Governors in Appendix D. These reports are: the Weighing Sector Meeting, December, 1993; the Measuring Sector Meeting, October, 1993; the Automatic Weighing Systems Work Group (under the Weighing Sector) meetings, June and October, 1993; the Near Infrared Protein Analyzer Sector meeting, August, 1993; and the Grain Moisture Meter Sector meeting, August, 1993. The Weighing Sector meeting was held in Sacramento, CA, in coordination with training provided by Canada's Legal Metrology Branch to the NTEP Participating Laboratories. Canadian technical experts taught the NTEP Labs to conduct the Canadian portion of type evaluations on those scales for which mutual recognition of type evaluation began April, 1994. The Automatic Weighing Systems Work Group, under the Weighing Sector, has held separate meetings and is ahead of schedule; the work group has been requested to extend its objectives to develop type evaluation criteria beyond automatic weighing systems for meat and poultry plants to include systems for the shipping industry. The other work group under the Weighing Sector, Class IIIL Scale Testing, is circulating Module 5 on Vehicle Scales to recommend improvements. Three work groups were formed under the Measuring Sector: one to recommend accuracy classes (Mel Hankel, Liquid Controls; Jack Jeffries, FL; Ron Murdock, NC; Chuck Strawn, Schlumberger Industries; and Rich Tucker, Tokheim Corp.); one to develop test procedures of compressed natural gas meters (Chuck Miller, DVCO; Gordon Johnson, Gilbarco; Mike Keilty, Micromotion; Richard Huff, Universal Epsco; a representative from Daniel Industries; and Charlie Nelson, CA); and a third to develop a checklist for mass flow meters (Mike Keilty, Micromotion, Chairman; Eric Kappelt, Smith Meter; and Chuck Strawn, Schlumberger Industries).

## **102-10 I Policy, Extensions of Existing Vehicle Scales**

The Board of Governors requested that at its next meeting the Weighing Sector revisit the issue of mass produced extension kits. As a minimum, the sector is asked to write an ad hoc testing procedure for different combinations and applications, addressing mechanical and electronic weighing elements separately. The sector might also consider including guidelines in NCWM Publication 14 for jurisdictions to use in field evaluations of combinations of scales and extension kits, whether or not the kit has been type evaluated. Since no consensus could be reached by the Weighing Sector, the Board decided that the problem does not warrant further attention at the national level. Each State should be advised to test any extensions to an existing vehicle scale beyond the range of the existing CC and extensions by other than the OEM as if they were a new one-of-a-kind device since there would be no NTEP evaluation of the weighing system.

## **102-11 I Policy, Clarification of "One-of-a-Kind" Devices**

The Board of Governors adopted the following policy as developed by the Weighing Sector of the National Type Evaluation Technical Committee:

If a device manufactured for sale has been categorized and tested as a "one-of-a-kind" device and the manufacturer then decides to manufacture an additional device or devices, the device will no longer be considered "one-of-a-kind." This applies to a device determined to be "one-of-a-kind" by one weights and measures jurisdiction if the manufacturer decides to manufacture the device and install it in another State. In this case, the manufacturer must request an NTEP evaluation on the device through the normal application process unless NTEP has already deemed that such an evaluation will not be conducted.

Note that indicators and load cells in all "one-of-a-kind" installations must have an NTEP CC.

The OWM sent a memo to the States to request that they communicate by fax with NTEP or use the NCWM computer bulletin board when they determine that a "one-of-a-kind" device is in place in their jurisdiction, so that this information may be disseminated to other jurisdictions in order to determine whether NTEP policy is being followed. NTEP entered this information in a publicly available file on the NCWM bulletin board so States can access the most current information.

**Discussion:** The National Type Evaluation Technical Committee Weighing Sector developed the following policy guidelines for consideration by the Board and entry into NCWM Publication 14:

1. If a scale company converts an existing structure, such as a hopper, into a weighing device in an existing installation or retrofits an existing scale, the device can be considered to fall into the "one-of-a-kind" category under NTEP policy.

In this case, an NTEP CC is not required and the device should be evaluated for compliance with Handbook 44 by the individual weights and measures jurisdiction. This does not apply to equipment purchased by the scale company for conversion and installation into a new location, which falls into the category of "remanufactured."

2. If a device manufactured for sale has been categorized and tested as "one-of-a-kind" and the manufacturer then decides to manufacture an additional device or devices, the device will no longer be considered "one-of-a-kind." This applies to a device that has been determined to be "one-of-a-kind" device by one weights and measures jurisdiction if the manufacturer decides to manufacture the device and install it in another State. In this case, the manufacturer must request an NTEP evaluation on the device through the normal application process unless NTEP has already deemed that such an evaluation will not be conducted.

Note that, for all "one-of-a-kind" installations, the weights and measures jurisdictions should require the device to use an indicator and load cells with an NTEP CC.

In discussion with the Weighing Sector Chairman, John Elengo, and Technical Advisor, Tina Butcher, the Board of Governors decided to adopt only item 2 of the recommended policy, and that it should become general policy, not applying only to scales and weighing systems. There was disagreement among the Board members about the advisability of recommending item 1 at this time due to differing enforcement policies in the separate States. Some members were opposed to forcing the jurisdiction to completely test devices when the conversion of a hopper of a given design into a weighing device might be equivalent to a series of conversions by the same company resulting in the same final design. In other words, some conversions might not create unique "one-of-a-kind" devices. Other Board members both disagreed and agreed with item 1 based on their experiences with conversions. Disagreement with item 1 is based on field conversions being made into a weighing system with equipment that was not intended to weigh, and that the resulting weighing systems should not even be allowed. Agreement with item 1 is based on the fact that States can test these "one-of-a-kind" systems to the extent equivalent to NTEP; it just requires a great deal more resources in time, equipment, and effort to do so. This is unfortunate, but necessary. In order to get these systems to perform, there is a great deal of custom manufacture and assembly. Because some of the equipment is old and some new and some manufactured on site, the initial installation should be thoroughly tested.

## 102-12 I Policy, Repaired and Remanufactured Scales

The Board of Governors had not been able to discuss this item at the 78th Interim Meeting in the detail that it deserved, and intended to do so at the 1994 Interim Meeting. The Committee plans to act on items 102-10, 102-11, and 102-12 during the coming year. Members are invited to comment as soon as possible on these items.

The Weighing and Measuring Sectors were requested to discuss the issue and provide more guidance to the Board, which is prepared to accept the interpretation and guidance of the Office of Weights and Measures (provided below) if there is no opposition. The Measuring Sector was asked to suggest how the NTEP principles should be applied to repaired and remanufactured measuring devices and systems. The weights and measures community is asked to study this issue, discuss it in the regional meetings, at trade association meetings, and when considering State policy on repaired and remanufactured devices, not only scales. Please call or write with your input on this critical issue. As States have moved to require NTEP CCs, OWM has received inquiries regarding application of how NTEP policy to repaired and remanufactured equipment, including devices assembled from used parts of the same make and model or from used parts from different models made by the same scale manufacturer.

Remanufactured equipment is defined as the overhaul or replacement of parts to enable a device to be installed in a new location. Repair is defined as the maintenance or replacement of parts for a device remaining in the same location.

**Discussion:** Henry Oppermann authored a memorandum on November 9, 1992, summarizing policy and stating the OWM position regarding issues where definitive policy had not been established. That memorandum serves as the basis for policy development through the NTETC Sectors and the NTEP Board of Governors; it focusses on scales, but many aspects are applicable to all commercial devices.

### *Current NTEP Policy*

1. An NTEP CC applies to the specified design (type or family) for a specific manufacturer, the parameters for which are often defined through NCWM Publication 14.



2. If a company copies the design of a device made by another company that has a CC for the device, the CC does not apply to the "copy." The company that copied the device must get an evaluation of its "type" because critical aspects of the original manufacturing process and quality control may significantly effect the performance. These aspects may not be evident in the finished product and may not be incorporated in the process used to manufacture the "copy."
3. Scales Code performance requirements under T.N.8. Influence Factors Requirements apply to electronic devices. If an electronic scale had a type evaluation before 1986, the type must (or had to) be resubmitted for an appropriate form of type evaluation to determine compliance with the influence factors requirements. Small scales had to be submitted for testing over a temperature range. Larger capacity scales that had a CC or an OWM Report of Test prior to 1986 had to be modified by using load cells and an indicator with NTEP CCs to obtain an updated NTEP CC for the scale.
4. Mechanical scales (excluding belt-conveyor scales because of the belt) are not considered to be affected by temperature changes. Consequently, the original CC or OWM Report of Test is still valid and no additional testing is required.
5. Virtually all weighbridge designs must have their own type evaluations. At the June 1992 meeting of the Weighing Sector, it was concluded that concrete and steel weighbridges (load-receiving element) for the same weighing element design and produced by the same manufacturer must each receive its own type evaluation. A memorandum dated January 3, 1991, provides more detail regarding the type evaluation of weighing elements.
6. NTEP recognizes "one-of-a-kind" devices, designed or customized for a specific application in a specific installation. This concept does not permit multiple devices of the same device to be installed in different States (although there may be only one per State) and still be classified as one-of-a-kind. When a "unique" design becomes a standard product, in that multiple devices are subsequently manufactured, then the device must be submitted for type evaluation and a CC issued before it can be accepted in those States that require an NTEP CC.
7. Replacement of "metrologically-significant" mechanical parts with parts of a different design (e.g., the replacement of levers with levers of a different design) invalidates the original CC.
8. If a company buys NTEP load cells and an NTEP indicating element and then manufactures a scale from the parts, the complete scale must be submitted for type evaluation to assess its performance characteristics for compliance with Handbook 44.
9. If load cells are repaired by other than the original manufacturer or the manufacturer's authorized agent, then the CC for the load cell does not apply to the repaired load cells.

In June 1992, the Weighing Sector of the Technical Committee on National Type Evaluation discussed the remanufacture of scales and which devices must be submitted for type evaluation. **Remanufactured equipment is defined as the overhaul or replacement of parts to enable a device to be installed in a new location.** The criteria are listed below.

- (1) If a device with an existing NTEP CC is remanufactured by the original equipment manufacturer (OEM) or authorized agent using OEM parts, no additional evaluation is required, and the original CC applies, *provided* that the remanufacturing process does not modify the design of the device.

If a device without an existing NTEP CC is remanufactured by the OEM or authorized agent, the device must be submitted to NTEP for evaluation in order to be recognized on an NTEP CC.

- (2) If a device with or without an existing NTEP CC is remanufactured by a company other than the OEM or authorized agent, it must be marked with the remanufacturer's name, model designation, non-repetitive serial number, and the qualifier for the serial number as required by G-S.1., General Code of Handbook 44.

The device must be submitted to NTEP for evaluation; the device submitted to NTEP for evaluation should be a device considered by the remanufacturer to be a "typical" example of the remanufactured devices overhauled by the remanufacturer.

- (3) Remanufactured devices will be evaluated in the same manner as newly manufactured devices, using the same test procedures and criteria. No test results obtained for the original equipment will be accepted in lieu of actual testing.

- (4) The same guidelines for including parameters of a device on a CC that apply to newly manufactured equipment shall apply to remanufactured equipment.

**Repair is defined as the maintenance or replacement of parts for a device remaining in the same location.** The guidelines for the repair and replacement of scale parts are as follows.

- (1) The repair of a mechanical scale with parts consistent with the design and quality of the original parts does not invalidate the CC.
- (2) Except for the substitution of load cells identified earlier, the policy regarding the repair of electronic scales by replacing various electronic components has not been agreed upon. The replacement of electronic components that affect the analog-to-digital converter, gain circuitry, and dead load may affect compliance with the influence factors of Handbook 44.

#### *Basic Principles*

Specific issues have been raised regarding the repair, remanufacture, and replacement of parts, particularly in mechanical scales. It is necessary to reference some basic principles that can be applied to provide guidance in the areas where definitive policy does not exist. Some of the repair issues have been discussed by the Weighing Sector on at least two occasions. Agreement was not reached on all issues because many companies or service agencies repair scales of different manufacturers, consequently the ramifications of restricting "minor" repairs would be extremely disruptive to the maintenance of equipment. The following principles form the basis for NTEP policy and practices:

1. A manufacturing site may be moved, but the manufacturer is responsible for manufacturing the device consistent with the original type. The manufacturer is expected to apply the same quality control procedures regardless of location.
2. A CC does not apply to a similar device made by another company, even if the design was "copied" from a device with a CC, because the quality control aspects and any specialized manufacturing techniques may not be part of the manufacturing process of the other company. Consequently, any company that is not authorized by the OEM to manufacture or install the device must demonstrate through a successful type evaluation that the device model is capable of complying with Handbook 44.
3. Metrologically equivalent parts may be substituted for parts produced by the OEM. The criteria for metrologically equivalent load cells have been developed, but the details of metrological equivalence for other equipment or parts remain undefined. This is similar to the situation where NTEP must make judgments of when a device has undergone a significant modification. (See Section I of the Administrative Procedures for NTEP in NCWM Publication 14.)
4. Superficial differences (differences that are not metrologically significant) among devices are permitted.
5. The OEM may authorize a distributor to sell the manufacturer's product (equivalent to the device originally type evaluated), but with the distributor's name and model designation. The original manufacturer remains responsible for ensuring that the model sold by the distributor is equivalent to the original design. This process does not work in reverse. For example, if a device is manufactured by a company, but is submitted for type evaluation by a distributor, the distributor can obtain a CC for the device, but another CC cannot be issued to the original manufacturer at a later date without a new type evaluation because the distributor does not control the manufacturing process. The distributor specifies the criteria for the product, consequently the distributor cannot ensure that the device marketed by the device manufacturer is the same as what the distributor receives.

#### *Responses to Specific Issues*

Several questions have been raised regarding repair practices and devices routinely encountered in weights and measures enforcement. Several States have requested guidance regarding the position they should take when requiring that only NTEP devices be installed in their jurisdiction. The positions of the Office of Weights and Measures are reported below.

1. The repair or replacement of weighbridges has not been addressed by the NTEP Weighing Sector and is not addressed by NTEP policy. However, if the replacement weighbridge is consistent in design, material, and strength of material, then it seems that the new weighbridge is metrologically equivalent to the original. In this case, the original manufacturer will probably not assume responsibility for the repaired device (which is in a sense equivalent to voiding a manufacturer's

warranty), but the metrological characteristics of the device have not been changed. In this case, the original CC would still apply. If the weighbridge design is modified, then the metrological characteristics may have changed and the original CC does not apply.

2. Replacement parts for mechanical scales, such as pivots and bearings, are not type evaluated. NTEP has avoided component testing restricting its activities to main elements, such as indicating elements, weighing/load-receiving elements, and "intelligent" recording elements (printers). By necessity, load cells are evaluated because NTEP is unable to test the complete weighing/load-receiving element in an environmental chamber. Consequently, to determine compliance with influence factors for medium and large capacity scales, it is necessary to test load cells separately.

In terms of replacement parts for mechanical scales, the business of manufacturing replacement parts by companies other than the OEM was well established before type evaluations were initiated through NTEP. Consequently, the practice and acceptance of the replacement of "metrologically equivalent" mechanical parts is in place. In principle, the substitution of metrologically equivalent parts does not invalidate the CC.

The replacement of circuit boards with rebuilt boards will not be apparent to weights and measures inspectors. Replacement of some electronic parts will certainly affect compliance with the influence factors requirements. Replacement of electronic parts that affect compliance with influence factors requirements will void the original CC, but no policy addresses this type of repair.

Care must be taken regarding the repair and replacement of parts for mechanical scales to be sure that manufacturers do not become overzealous by attempting to restrict the source of parts to repair a scale to the original manufacturer, to the exclusion of equivalent parts manufactured by competent companies. The point at which this occurs is not defined. Weights and measures officials must use judgment in making these decisions.

3. The appropriateness of assembling a scale from used parts by other than the OEM has not been specifically addressed. It is the opinion of the Office of Weights and Measures that the original CC does not apply to the reassembled device because the quality control of parts by the original manufacturer and the control over the assembly process may not apply to the reassembled scale. It is unlikely that the original manufacturer would assume responsibility for the reassembled product, so it becomes the product of the remanufacturer. NTEP does not have a policy addressing devices assembled from used parts.

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## Executive Committee



## Appendix A. Final Report of the Privatization Work Group

Allan M. Nelson, Connecticut, Chairman

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#### Summary

"Privatization" is defined in this study as the shift of responsibility for maintaining equity in the marketplace from the government sector to the private sector. The future of weights and measures as a government function appeared to be under siege in many parts of the Nation when the Task Force on Planning for the 21st Century recommended that the issue of "privatizing" weights and measures be studied. Reports that several states had improved their programs by privatizing weights and measures functions elicited very negative responses from many weights and measures government jurisdictions.

On the recommendation of the Task Force on Planning for the 21st Century, the Executive Committee established the Privatization Work Group to study the issue from several perspectives:

1. Was there information from either those who had "privatized," or had refused to privatize did not have, which would permit consensus to be developed about rational alternatives to maintaining equity in the marketplace?

The Work Group found that those who had claimed to have privatized did not know the full extent of the weights and measures regulatory functions to maintain a fair marketplace. In general, governments that had "privatized" had shifted device testing activities to private service and repair agencies, but had not found ways to privatize testing packaged commodities, transaction verification, investigation of complaints, or the enforcement of weights and measures laws and regulations.

The Work Group also found that most weights and measures agencies had already privatized testing and placing devices into service after installation or repair. Most weights and measures agencies in other countries had not privatized that far. (Two reports prepared for Canada's Legal Metrology Branch are available upon request.) Weights and measures regulatory agencies must find ways to partner with private sector groups to effectively maintain equity in the marketplace. Government agencies cannot contract for or transfer to the private sector those functions that are regulatory and enforcement in nature.

**The Work Group concluded that:**

- a. Government decision makers who believe that weights and measures can be privatized do not understand the scope and breadth of weights and measures, nor its intrinsic regulatory nature for maintaining equity in the marketplace.
- b. Weights and Measures agencies should be prepared to explain the scope of weights and measures responsibilities when questions are asked about shifting functions to the private sector. Regulatory functions, police powers, rightly belong only to the government. The Work Group generated visual aids that assist in explaining the scope of weights and measures. (See pages 125-128, Report of the 78th NCWM, 1993.)
- c. Shifting device testing responsibilities from public agencies to private companies does not privatize the weights and measures regulatory function. Government oversight over device testing is still required when private companies, such as food stores, are required to purchase testing services (for their scales, for example) from other private companies. (See pages 58-61 in the 1993 Report of the 78th NCWM.)
2. Was the negative response to the concept of privatization merely a self-serving response by government agencies that private businesses did not share?

The Work Group was established with both public and private membership. The Scale Manufacturers Association and the Gas Pump Manufacturers Association both declared that privatization of marketplace regulation was not possible, nor was it desirable, from the perspective of businesses trying to compete in a marketplace that would degrade to a "free-for-all." (See page 61 of the Report of the 78th NCWM, 1993.)

**The Work Group concluded that marketplace regulation cannot be privatized and that even more than ever there is a need for weights and measures government presence.**

- a. Unfortunately, many businesses do not understand the need for weights and measures enforcement. It is imperative that weights and measures seek out its business customers and explain what weights and measures government agencies can do to assist business. Weights and measures at all levels needs to market its regulatory services. (See Chairman Tom Geiler's speech appended to this final report, page 79.)
- b. Weights and measures cannot continue to do its job in the same way as always, however. Whether weights and measures regulation is supported by general taxation or by fees to businesses, it must devise ways to gain greater efficiency at the same or reduced costs. This includes greater use of computers and use of sampling in more than the package testing area. (See Darrell Guensler's discussion appended to this final report, page 77.)
3. What steps could be taken to improve equity in the marketplace within the resources available?

The ultimate objective of privatization is to save government revenues for other purposes. Introducing efficiencies and increasing program effectiveness can also save government resources. The Work Group discussed many alternatives to traditional weights and measures activities that might increase efficiency and effectiveness, such as sampling from a device population (also called variable frequency of inspection), similar to sampling packages for net contents testing (See page ?.) Cross-jurisdictional measures to determine the effectiveness of program alternatives are lacking.

The Work Group determined that (1) the as-found errors in devices should be recorded (rather than allowing the device owner to rezero his device before testing); and (2) the actual errors in devices should be recorded (rather than just "in" or "out" of tolerance) so that the economic impact of errors can be estimated as compared with program costs. These numerical estimates can be used to set the "benchmark" level of equity at a particular time. Changes in program can then be assessed against these benchmarks as to their effectiveness.

The Work Group recommends that a new work group be established to build on the outlines of what individual agencies and this work group have done to measure the benefits of weights and measures activities. The objectives of this work group would be to devise ways to measure whether changes in process, procedures, or program are actually improvements. Its scope of work would be to provide tools to measure the benefits and costs of individual parts of a weights and measures program, and to provide uniformity in reporting those measures and uniformity in the meaning of the data reported. The Work Group would report to the Education Committee or its successor, the Administration and Public Affairs Committee.

The Work Group also recommends that a second work group be added to the NCWM already formed by the Central Weights and Measures Association to develop standards for a jurisdictional accreditation program. This work group should also report in some way to the Administration and Public Affairs Committee. See Sid Colbrook's remarks at the end of this report.

#### *Earlier Meeting Reports and Products*

The first meeting, October 1992, produced a set of visual aids that could be used or modified to describe weights and measures and explain the regulatory functions that cannot be shifted to the private sector. At this meeting, the Work Group analyzed the functions of maintaining equity in the marketplace. Traditional functions begin with the metrology laboratory to assure accuracy in transactions involving measurements, on through a list of other functions and activities, including sampling from marketplace transactions.

Members of the Conference and Work Group also wrote letters explaining the weights and measures regulatory functions, and visited legislatures and other decision makers to provide rationale for maintaining weights and measures regulatory oversight by the government. This was successful for the States of Iowa, Massachusetts, and Washington, and the city of Indianapolis.

#### **The Kansas Experience**

The second meeting was held June 1993 in Topeka, KS, because Kansas has advertised its weights and measures program as being more effective than ever as a privatized program. The Work Group found that Kansas required all businesses to get their commercial devices tested annually by a private service company. However, Kansas weights and measures was not privatized in the sense defined by the Privatization Work Group; that is, maintaining a fair marketplace continued to be the responsibility of Kansas State government. Kansas maintained approximately the same staffing level, still checked packages, scales, and handled complaints. The State had found that the frequency of inspecting and testing large capacity scales had declined over the years to about a 4-year cycle. Kansas now requires annual testing at the expense of the device owner, and uses its staff to test devices after repair agencies had performed their annual inspections. In this way, Kansas maintained its regulatory oversight over the marketplace.

Since Kansas had not had the resources to inspect annually, they mandated that businesses buy annual inspections from the private sector. However, they do not empower private companies to reject or condemn devices, and the State oversees the work of the private companies. Kansas still needs more resources to train these companies and to better utilize them as contractors of the service part of the weights and measures function. For example, the repair firms that the Work Group talked with did not inspect devices against specification requirements; they tested the devices and adjusted them to perform within tolerances.

#### **The Washington State Experience**

The third meeting of the Work Group was held in November 1993 in Seattle, Washington. A report of this meeting is on page 104. The purpose was to discuss a study conducted by the Washington Office of Financial Management on the subject of the cost benefit of weights and measures in Washington, and to compare that with other States. Although the study did determine the very real economic benefits of weights and measures in Washington and led to the continuation of the program, the study leaders were not able to evaluate the worth of the Washington program in comparison with other States. The lack of uniformity in the report to Washington was yet another instance of the harm often caused by nonuniformity in reporting and field enforcement (assumed because the compliance rates were so very different from jurisdiction to jurisdiction). Several recommendations were made about the kind of data needed to make cost/benefit decisions. Work Group members who direct weights and measures regulatory programs submitted copies of their reporting forms and quickly came to the conclusion that standardized report forms are needed in order to compare compliance data and error rates. The Work Group also noted that actual errors need to be recorded in order to make economic evaluations.

#### **Analysis: The Regulatory Role of Weights and Measures**

Many definitions of "privatization" are quite general, often, meaning the shift of services from government to private sources in order to save government funds for other priorities. Privatization of such services as trash collection, parks maintenance, and hospitals are examples of successful shifts from public to private providers. However, the heart of weights and measures is regulation of the marketplace to maintain equity, although many weights and measures activities are perceived as services. The Work Group hypothesized that privatization of weights and measures may seem reasonable to some groups since it is viewed as a device-testing service, not as a general regulatory function of government. If a State can split service from regulatory functions, then the service portion may be privatized. Thus, all but 12 States have regulations that permit private agencies to install devices and place them into service without the presence of weights and measures officials. Kansas has gone one step further, requiring devices to be tested at least annually by a private company. Kansas retains its regulatory



powers and thus must maintain its capability to test devices, hence must add to its resources the capability to train the private companies that test devices.

### **Weights and Measures Is Not a Device Testing Service**

If we focus on today's weights and measures agencies, we see that many are reducing staff and other resources so that they little more than test devices; this is inadequate marketplace oversight. All weights and measures agencies should also be ensuring that potential customers are adequately informed, training and inspecting the work of registered repair companies and weighmasters, testing packages, and buying and selling undercover to ensure that entire transactions are conducted fairly. Under tough fiscal constraints, the only way jurisdictions can possibly find the time and resources to look at other elements of the marketplace is by devising ways to sample devices, not test every device annually. Jurisdictions know that they should focus resources on transactions with poor compliance levels. Unfortunately, many agencies feel trapped into generating fees for device testing. In other words, they must convince decision makers that licensing and fees must support the other elements of weights and measures marketplace oversight. Fees must be set high enough to support the total program or general tax revenues must be made available for these other activities for which fees cannot be charged.

### **Communications with Decision Makers**

In order to justify the amount of fees or general tax revenues supporting a weights and measures program, legislators, governors, business leaders, and the general public must be made aware of the benefits of marketplace regulation. Weights and measures agencies and their management must interface with the community they serve, explaining the weights and measures function and how it helps, and listening to the community to find ways to serve them better, more effectively, more efficiently, and at less cost. NCWM Chairman Geiler provided a copy of his speech on the subject of privatization; it is appended to the end of this report and will provide for thoughtful discussion by those considering privatization of weights and measures functions.

### **Economic Benefits of Weights and Measures**

Weights and measures agencies need measures of effectiveness against which to compare changes and determine the efficacy of their programs. This was a serious flaw in Washington State when it discussed privatizing weights and measures. There was no data available on the economic value of weights and measures regulation in Washington. The data provided by other States in response to a questionnaire from Washington indicated that there were no uniform measures that could indicate the economic value of the basic functions that cost the most, such as device inspection. Washington State has been collecting some of that data over the past 2 years, the indication that economic benefits far outweigh the costs. For example, in the area of large capacity scale testing in Washington, which costs the state less than \$500,000 to operate, annual dollar savings from devices that would have continued to be used without repair when they were in fact operating beyond the tolerances were more than \$30 million dollars. Unfortunately, this information was not available before the State Legislature decided to withdraw general tax revenues as a source of funding this program. However, the program is now fee supported and there is general agreement that weights and measures is a necessary government function. A copy of the Washington State Study is available from the Office of Weights and Measures.

### **Final Meeting Report**

The final meeting of the Privatization Work Group was held June 1994 in Las Cruces, NM. It was held to summarize the work and to make one last attempt to determine whether means and methods were available, or would have to be invented, to permit comparison of compliance levels, cost, or economic benefit from one jurisdiction to another.

### **Record As-Found Error**

Dave Smith, NC, piloted efforts in his jurisdiction to collect data on the actual errors found during device testing. His studies indicate that the field officials cannot test as many devices when more data must be collected. The officials must be retrained and the report forms modified. For example, inspectors cannot immediately disconnect automatic temperature compensators when testing volume delivery devices. They must run an additional test in the as-found condition in order to determine the amount of error that would presumably continue if weights and measures inspectors had not tested at that time. In addition, the field inspector cannot effectively obtain the sales data or other economic value data of the commodities being measured. To estimate the economic value of inspection will require the State office to find the economic value of commodities being measured. A state office can obtain this information from state or regional trade associations and marketing boards. Mr. Smith's report is appended to this report.

Darrell Guensler pointed out that until one can measure effectiveness of a program, there is no way to measure whether changes can improve it. He pointed out that we must list the objectives and outcome measures for each element of a program, then have national norms against which to compare. Only through this standard setting and data collection can the promise of future efficiencies from sampling devices, rather than testing each one, be assessed. One of the prime statements

made at the Work Group meetings, is that Weights and Measures agencies must learn to "hoe where the weeds are." As resources diminish, we must resort to selective testing and focus on worst actors. A cop on the beat has a deterrent effect, but few jurisdictions can afford more cops on a beat. Mr. Guensler also pointed out that we must find different ways to fund our programs; assessing a license or fee demands that agencies test annually as external proof that businesses are getting value for their fee. This does not permit rational programmatic adjustments.

As a result of discussion at this last meeting, however, the Work Group decided that recording the actual error and as-found errors should be collected as part of a sampling effort in each jurisdiction to determine the "marketplace conditions" at the time of the survey. It is not necessary to record the as-found error and the actual numerical errors found for every device tested. A sample will also provide the economic information needed. Chip Kloos, Hunt-Wesson, provided guidance on sampling and some simple sampling plans as tools for determining the level of compliance without having to test every device (or every business). His report is also appended to this report.

Mr. Kloos provided a report that guides inspection agencies through widely available sampling plans, Military Standards 414 and 105-D, showing to read these plan to determine how much sampling of the population (of meters, of scales, of businesses, of business locations) is needed to be effective in lieu of 100% testing. The Military Standards have been widely used since World War II as decision tools to determine when to increase testing if results are poor and when to reward suppliers or companies who routinely comply.

Mr. Kloos provided descriptions of how to use these standard statistical tools both for decision making and for estimating the level of compliance. Military Standard 105D is called a set of "attributes" sampling plans, that is, one decides whether a device, for example, is in tolerance or not; is "good" or "no good"; black or white. Military Standard 414 is called "variables" sampling plans, because one can often record the actual measurement value associated with any inspection, for example, the error for each device, such as -4 cu in. Attributes sampling plans require larger sample sizes than variables sampling plans, but both give valid results. Handbook 133 provides variations on Mil Std 414 as a means to test the net contents of packaged goods. All sampling plans are based on taking random samples. Alternative sampling might include cluster sampling, which is useful when most of the inspector's time is spent traveling to and from an inspection site. Another type of sampling is called stratified sampling. These tools allow us to concentrate either on devices or on businesses.

#### **Uniformity at the Enforcement Level**

The need for uniformity at the enforcement level was one of the key issues identified by the Task Force on Planning for the 21st Century. Washington State and the Privatization Work Group were not able to cross compare the effectiveness of different jurisdictions due to the differences in interpretation, nor the information they recorded about what they did. In Kansas, the data before and after requiring annual testing by private service agencies was non-intercomparable due to a lack of uniformity in what was considered noncompliance before and after the program was changed. This affected the resulting statistics of the efficacy of the programmatic changes. When the Work Group investigated whether there were model report forms or other information in the training modules that might be used to standardize reporting, only the net contents package inspection module, Module 10, had a standardized report form. Another standardized report form is that of the U.S. Department of Agriculture's Packers and Stockyards Administration form for testing livestock scales. The Work Group agreed that if standardized reporting were instituted, much greater uniformity in testing and inspection would result. **The Work Group recommends the survey and establishment of standards in reporting key numerical data on errors found in the marketplace to use for measuring the state of equity and the effect of changes.**

#### **The Added Efficiency of Computers**

Although not absolutely mandatory in order to benefit from standardized reporting, government agencies should take advantage of the labor savings that computers can provide. In order to establish a central data bank either within the State headquarters or at the national level, data must at some point be made accessible by computer. The greatest efficiency would be to provide field inspectors with lap-top computers for field entry of data. Today computers are much more rugged and will hold up in hostile field conditions much better than their predecessors. In addition, tiny battery-powered printers are available that can provide a professional report in the field to the business on-site. Linking a lap-top computer by modem to a central office computer to upload and download the data provides additional speed of data entry without the usual keyboard data entry errors that occur when one person tries to read another person's handwritten information.

Some jurisdictions have computerized their package inspection reports. One jurisdiction, Kern County CA, is in the process of computerizing all its inspection reports. Ideally, we should seek uniformity in computer programs and data while these new systems are being invented. California may be able to purchase a few lap-top computers and provide pilot study experience in this area. NIST OWM is evaluating an off-the-shelf software package, a front-end application that permits data bases to accept data from an electronic report form. OWM expects to evaluate it with the NTEP Laboratories and eventually

expand it. Sid Colbrook reminded the Work Group of the absolute necessity for developing standardized test procedures for all aspects of weights and measures activities for which data may be collected, ensuring that any information system is compatible with a national system. **The Weights and Measures Information System (WAMIS) computer bulletin board is underutilized and could be a convenient vehicle for collecting national data. A survey is needed to determine what systems and software jurisdictions are currently using.**

Another advantage of computer access in the field would be accessibility to all the helps in testing procedures, such as providing a compact and portable way to prompt and guide field inspectors in test and inspection procedures. Computers can contain all of the handbooks, modules, and examination procedures and have examination procedure outlines integrated with the report forms as guides to assist the inspector who is conducting the test. This would be a great aid to any inspector who must conduct an inspection in a while. **The successor of the Privatization Work Group should survey the jurisdictions to determine what computer programs are already in use to record data from the field, the type of data that is collected, and the purposes for which the data is collected.** The Work Group believes that portable computers will become as necessary an adjunct for field inspection as traceable weights and provers.

### **Program Accreditation**

Sid Colbrook, IL, discussed the efforts of the Central Weights and Measures Association (CWMA) to establish a weights and measures accreditation program within the Central region. CWMA believes that standards for all aspects of a weights and measures government agency should be established and that accreditation should be offered to those programs that meet these standards. CWMA has a volunteer corps to develop the standards, namely Sid Colbrook, Steve Malone, NE, Jim Truex, OH, and Tom Stabler, Mettler-Toledo. CWMA discussed the possibility of conducting an audit of a state program against the standards, not only of its administration and management, but also of the marketplace condition within the jurisdiction. Several years ago the Conference evaluated of weights and measures programs with a group of three to five NCWM members visiting and reporting on their general status. There were general criteria, but they were not strictly applied. CWMA thinks that jurisdictions are now ready for more standardization and the resulting benefits. The accreditation program has five primary objectives: development of uniform testing procedures, uniform training for inspectors, uniform training for administrators, uniform standards for metrology, and a higher degree of integrity in the overall programs. Industry will benefit from uniformity, of course, but State now realize potential benefits as well. Having adopted Handbook 44 isn't enough to attain enforcement uniformity; we need peer pressure to stay uniform. Weights and measures agencies make short cuts that they shouldn't.

Linking the CWMA group to the NCWM would have mutual benefits. CWMA would get resources from the Conference and a technical advisor. The NCWM Administration Committee would get highly motivated volunteers to flesh out minimum standards. **Mr. Colbrook's presentation is appended to this report. The Work Group believes that the CWMA group should become a work group under the program evaluation group recommended to carry on the work of the Privatization Work Group.**

### **Industry's Role in Delivering an Effective Weights and Measures Program**

Enlightened businesses are NCWM members. Slightly more than half the membership of the NCWM is Associate, that is, from private sector participants. It is important that neither individual weights and measures agencies nor the NCWM itself lose sight of industry as its customers. We have in the past 10 years begun to strength and formalize the vital relationship with businesses within the NCWM -- membership on the National Type Evaluation Technical Committee, on work groups, and on subcommittees. The moves that the Executive Committee is making to establish Associate membership on the Executive Committee is a very important step in bonding the business community at the national level to the regulatory community. Associate members are anxious to help bring new Associate members up to speed and enlist them in important work of the Conference. This same participation and interaction is needed at the State and local level. Some State weights and measures associations have strong and vital working relationships with their business leaders; others need to establish this as the only way that retailers can be educated to accept something different from annual testing as the service they receive for their licenses or fees.

Concerning the role of repair and service companies, no private business that sells or services equipment for a fee should ever be put into the role of condemning or taking equipment out of service. Service agencies can provide an important adjunct to government testing of devices, but only if they are provided adequate training. Unfortunately, no service agency can afford much of its own training, so a jurisdiction may have to require the training on laws, regulations, and test methods at least on an annual basis to get the expertise required. Many Associate members believe that this is not just a weights and measures government responsibility, but a shared responsibility to train service agency people. The Institute of Weights and Measures, an Associate membership underwritten effort, has trained hundreds of service people on NTEP these past 2 years. Some local divisions of the International Society of Weighing and Measurement (ISWM) also provide good "Scales on



Saturday" training. But adequate funding is never available, and most States have no training requirements for their registered service agencies. The only other driving force to get repair agency staff trained is when a jurisdiction "causes problems" by rejecting more than the normal number of devices. This gets service companies' attention, and causes unnecessary frustration on the part of the government agency, the device owner, and the service company alike.

Another improvement in the State weights and measures system would be a standardized test form for repair agencies instead of the different state reporting requirements and forms. Repair agencies are growing in size and many do business across State lines. Many States do not require any specific report form, or if they do, it is not the same form as used by their own staff. How can a State audit the adequacy of a repair agency not using the same report and not doing the same test?

It may also be time to change the Uniform Regulation for the Voluntary Registration of Service Persons and Service Agencies to a mandatory requirement. All repair firms should meet the same standards within any jurisdiction. Instead of removing their licenses, 12 weeks of training might be imposed when serviced equipment still does not meet tolerances. Device manufacturers would gladly participate in repair company training and provide vital resources. A jurisdiction must have the resources to test devices very soon after service in order to review the quality of any service company's work. Years ago the Laws and Regulations Committee studied the Registration Regulation and found that its greatest shortcomings then were the lack of administrative policy guidelines on how to test, train, and monitor repair companies. Data on repair firms cannot be adequately maintained without computer database information retrieval. This aspect of weights and measures government oversight should be part of the minimum standards for jurisdiction accreditation. **Remarks by Daryl Tonini, Scale Manufacturers Association, are appended to this report, focussing on industry's role in weights and measures. Mr. Rich Tucker, Tokheim Corporation, representing the Gas Pump Manufacturers Association, also provided his position in writing, also appended.**

Due to individual competitive issues, it is often the trade associations, rather than individual businesses, that actively support a weights and measures agency. As long as there are no "problems," businesses are uninterested in weights and measures. Individual businesses will more willingly help to provide training, but might not be as willing to go to a State legislature in support for weights and measures (although individual businesses have done so). Efforts by Ken Butcher this past year have led the Food Marketing Institute to offer the NCWM a booth at its mammoth trade show in Chicago next year. It is important to seize every opportunity to let businesses know more about weights and measures and why regulation will help their business.

#### **How Does a Weights and Measures Agency Funded by Fees Fund Package Testing and Undercover Purchases?**

Mr. Smith explained that fees are just a tax directed at a narrow segment of the business population. Weights and measures agencies should get involved when fee programs are introduced or modified to make sure that the fees are high enough to support other aspects of the weights and measures program. Device testing should be only a small part of any well rounded weights and measures program. All Work Group members were philosophically opposed to using civil penalties, fines or other retributive system, to support a weights and measures program. However, some legislators feel that there is no need for a regulatory program if there are no violations. The Work Group does not want any weights and measures agency to be perceived as bounty hunters. Programs should be able to demonstrate their costs and offsetting revenues from fees, fines, and other revenue sources, but not directly depend upon those revenue sources. Chip Kloos, from Hunt-Wesson said that the primary beneficiaries of package testing are the packagers and that they might very well be willing to support package testing programs. Unfortunately, the closest special interest groups speaking for weights and measures to the legislatures represent device manufacturers and service agencies. This gives additional credence to the perception of weights and measures as device testing agencies only. In addition, many agencies have been reduced to programs supported only by their device inspection fees and only test devices.

Some jurisdictions are considering other methods to generate funds, such as consulting or training businesses on a cost recovery basis. These services would be nonregulatory in nature and would not cost the taxpayer anything. For example, the NJ Department of Transportation is now trained and licensed to consult for businesses to reduce car use; their services are paid by industry.

Mr. Kloos raised the issue of in-plant inspection of packages as another area that would benefit manufacturers and which they might be willing to support. Mr. Guensler reported that California officials visit packaging plants about every other year, and that they use retail inspection as a means to force packagers to fill full net weight. Mr. Kloos said that his company's plants were located in five States, but that checking there would benefit all 50 States, and that funding such a project might be possible. Mr. Colbrook said that his agency would need additional clarification of authority to go into plant, for example, an inspection warrant, or administrative search warrant. Mr. Guensler said that the greatest benefit from in-plant inspection would be to the small packager lacking the statistical and quality control capabilities of large companies.

## Executive Committee

The Privatization Work Group concluded its work by offering to make its members available for guidance and continuity to assist the next work group, if the Executive Committee and Education Committee acts favorably on the Privatization Work Group's recommendations.

Privatization Work Group	
Allan M. Nelson, Connecticut, Chairman	Thomas F. Geiler, Barnstable MA
Sidney Colbrook, Illinois	Randy Hutton, Winn-Dixie
Tom Stabler, Mettler-Toledo	Jennifer Colman, Food Marketing Institute
Darrell Guensler, California	Chip Kloos, Hunt-Wesson, Inc.
N. David Smith, North Carolina	Daryl Tonini, Scale Manufacturers Association
Richard Tucker, Tokheim Corporation	Carroll Brickenkamp, NIST, Office of Weights and Measures
	Robert Bruce, Legal Metrology Branch, Canada

## National Data Sharing and Funding Concerns

by Darrell Guensler, California

### Why Collect Data?

There are at least two reasons to collect data. The first is to help improve program effectiveness and efficiency. The second is to provide information to help justify necessary programs in order to secure adequate resources to carry them out.

### What Data Should Be Collected?

Marketplace transaction data can reveal how accurate transactions are at a given time, help in priority setting, and be used as a bench mark to measure against in the future to determine program effectiveness. This data should include the average error found in a random sample (taken across the entire marketplace of the jurisdiction being evaluated) of a given type of transaction (retail gasoline transactions, packaged meat sales, scanner pricing transactions, etc.)

Also it is useful to record error information by

type of business (grocery versus discount drug, aluminum can buyers versus household movers, etc.),

by business name (Safeway, Thrifty, etc.) and

by region (county, city, etc.) if applicable.

This information may also aid in budget justifications.

**Complaint data**, recorded by type of transaction and by specific business, is also useful for priority setting and budget justification.

**Inspection result data** which includes detailed information on what was inspected, the results of the inspection, and the impact of the error (if applicable) is useful in various ways. Useful data includes:

For device inspections:

- manufacturer,
- model number,
- serial number,
- size or capacity,
- product measured,
- device owner,
- service company,
- as-found error converted to percentage, (at least one or two points in the inspection), etc.

For package inspections:

- packer,
- date of pack or pull date,
- package size,
- lot size,
- product,
- seller,
- as-found error, etc.

For bulk products sales verifications:

- seller,
- product,
- grade (if applicable),
- manufacturer (if applicable),
- as-found error, etc.

**Annual sales data** on the various products under inspection (devices, packages, or bulk) is necessary to properly extend the effect of the as-found errors.

**Population and general data** including workload measurements (number of devices, number of establishments, etc.), available personnel resources, costs (by program), number of people impacted by program (statewide population, etc.), and per capita costs are all useful.

### **Translate Error to Dollar Value Loss or Gain**

Error data can be translated to impact on the marketplace in several ways:

**Weighting or Measuring Devices.** By utilizing annual sales data in the jurisdiction and applying average retail prices and device errors to the equation, the overall impact of the mean error on the marketplace can be projected. Also, comparisons can be made to previous evaluations of the jurisdiction or to evaluations conducted on comparable jurisdictions. Further, with individual establishment information, projections can be made relative to the impact on fair competition between sellers. Finally, these impacts can be compared to the cost of providing the verification service.

**Prepackaged and Bulk Sale Commodities.** Similar evaluations can be made for packaged commodities or bulk sales. For example, (for purposes of the example, uncertainties are disregarded) if a random selection is taken of prepackaged meat in a county jurisdiction and the mean error is determined to be +1.51 percent, the impact can be projected in various ways. If compared to the mean error of -0.78 percent determined in a county which has no inspection program, the savings to consumers (based on annual sales of approximately \$62 million) is \$1.4 million for a program, which in this case, costs less than \$60,000 annually to operate. If compared to a statewide average of +1.69 percent, the results show that the program compares favorably to the larger area. If individual packer data is evaluated it may show significant enough differences to project fair competition comparisons.

### **Is Standardized Format Necessary?**

If the data is to be shared nationwide it must be collected in a standardized format. Field data should be collected and transferred electronically. Data format and accompanying software which enhances the field inspection as well as collects data should be centrally developed and disseminated to the participating agencies.

### **How Do We Fund Package Testing and Undercover Purchases?**

Weights and measures package testing and undercover purchases are properly funded through general tax revenues since the benefits are universal. If this funding source is not available, the next place to look is to the primary beneficiaries of the program.

In the case of undercover purchases, the primary beneficiary is the seller's competitor. Large errors which have a significant impact on buyers are normally self-evident and therefore self-correcting. Small errors normally only detected by weights and measures undercover purchases have minimal impact on individual buyers but have a significant impact on competitors trying to make a legitimate profit in the marketplace.

In the case of package checking activities, the primary beneficiary is the packer's competitor since, as stated above, most errors identified in the marketplace have the greatest impact on fair competition.

Finding an efficient method of taxing the primary beneficiaries is a difficult process. In the case of packagers, a tax could be levied on the number of packages produced or sold in a given jurisdiction. In the case of undercover purchases, a license fee could be established for businesses which make bulk sales of commodities.

Depending on civil penalties for funding may be a dangerous and possibly unethical procedure. It is however, quite appropriate to utilize the civil penalty process to recover investigative costs. Why should the law abiding business pay for the extra costs of investigation caused by the bad actor?

Another possible method of gaining better compliance, with less general fund resources, is to develop a cost recovery training and consulting program to offer businesses. Under such a concept, weights and measures could conduct non-regulatory inspections and training of store or plant personnel to better equip them for compliance with weights and measures requirements.



## Weights and Measures, a Service of Government or a Private Sector Function?

by Thomas F. Geiler, Barnstable, MA

Traditional weights and measures functions have been a service of government to protect the interests of buyers and sellers of measured commodities. This service has been viewed as a third party in all commercial transactions intent on ensuring equity by preventing any bias or fraud. In most industrialized countries this function has been provided by the Federal Government. In the United States, however, the responsibility for weights and measures services lies with the States by virtue of the States Rights portion of the U. S. Constitution. Many States patterned their State Constitution after the U. S. Constitution and shared their responsibility with cities and counties in structuring their weights and measures function as a joint state, county, or city responsibility.

One of today's buzzwords in and out of government is "privatization." This is a term often applied to the act of transferring a traditional government function to the private sector with the aim of reducing the cost of government, or increasing private sector competitiveness and improving service levels. There are as many definitions as there are proposals and each identifies some perceived benefit to a change in the structure of providing the service.

Weights and Measures services have increasingly been the subject of discussion as a possible beneficiary of privatization. Before we can begin to understand how such a proposal may impact the delivery of services, we need to understand the basic service of a weights and measures program. While there are variations from state to state in their weights and measures service delivery, the basic components of the function are very similar and usually consist of the following services.

A. Metrology Laboratory Program. A function where the state maintains traceability to measurement standards of the National Institute of Standards and Technology and is able to issue certification, to standards in use in that state by government and private industry, of the accuracy of those standards based upon a comparison to certified state standards. This function is the foundation of every weights and measures program and provides for uniform standards world wide through state, national, and international metrology agreements.

B. Device Inspection Program. A program of providing certification, usually annual, to all commercial weighing and measuring devices in operation in the jurisdiction. The certification is issued upon a satisfactory inspection and test of the device that indicates that the device is accurate, within prescribed limitations, through the full range of its indications and that it is correct. To be correct a device must conform to standard design requirements and specifications, be used for the purpose for which it was intended, and not be susceptible to or modified for fraudulent use.

C. Net Weight Compliance Program. A program where a percentage of prepackaged commodities are randomly selected and tested to determine compliance with the stated quantity. Inspections are done in packaging plants, warehouses, and retail outlets and involve a full range of commodities. The vast majority of commodities inspected in this program are commodities that were weighed or measured on noncommercial devices that are not inspected in device inspection programs.

D. Transaction Verification Program. A program where inspectors will make undercover or test purchases of commodities to determine the accuracy of the stated quantity. This function is generally a random sample process on a percentage of the total number of commodities available and may also be the result of complaints. Generally, the target is non-prepackaged commodities such as found at service deli, fish, meat, and dairy counters, etc., or petroleum products, such as gasoline, diesel fuel, home heating oil, etc., purchased through a metering system. This program provides verification of the accuracy of a stated quantity and may frequently involve a product, such as gasoline of home heating oil, which the consumer has no means of verifying the quantity received. This function may frequently involve the use of a device which was inspected in the device inspection program and provides additional verification that the device is being used correctly and not in a fraudulent manner, and is maintained in an accurate and correct condition.

E. Complaint Investigation Program. This program provides a process to investigate complaints received from consumers and industry relating to measurement shortages and overcharges. While many of the complaints received will fit into the everyday investigation of one of the other existing weights and measures functions, many will not. Complaints regarding the sale of firewood, coal, building materials, etc. will require investigation outside of those normally conducted by existing programs.

F. Government Purchase Verification. Most weights and measures jurisdictions provide assistance to other government agencies within their jurisdiction in verifying the quantity of purchased goods. Everything from fuel to school lunch food



## Executive Committee

items, road sand and salt, paper products, chemicals and fertilizers, etc. may be remeasured by weights and measures officials for other government agencies to ensure full value for government purchases.

G. Packaging and Labeling Regulation Program. Weights and measures regulations include the Uniform Packaging and Labeling Regulation which is modeled after the Fair Packaging and Labeling Act adopted by federal agencies. This regulation requires a uniform approach to packaging and package labeling to provide consumers with a clear, accurate declaration that assists consumers in making value judgments. These regulations also prevent misleading or deceptive packaging or labeling practices designed to confuse or deceive the consumer. This program involves inspection of a random sample of prepackaged commodities offered for sale in the marketplace.

H. Method of Sale Program. Either through individual state laws or through the Uniform Regulation for the Method of Sale of Commodities, all states have some form of consumer protection to prevent deceptive method of sale practices which prevent value comparisons by consumers. Method of sale regulations and laws specify the appropriate unit of measure for a particular commodity and require all commodities of a particular class be sold by a prescribed method of sale to allow for value comparison and prevent confusion or deception. Weights and measures departments are frequently called upon by industry within their jurisdiction for assistance in developing appropriate packaging and labeling formats for new products. A random sample survey is utilized to ascertain compliance in the marketplace.

I. Unit Pricing, Item Pricing, Open Dating. Most states have either a mandatory or voluntary regulation, or a combination of both, to regulate Unit Pricing, Item Pricing and/or Open Dating. In this program, assistance is provided to local industry in understanding their requirements in these areas, as well as a random marketplace survey to determine compliance levels.

J. Weighmaster Program. A program to provide a registration, licensing and enforcement process for "public weighmasters" or third-party measurers in commercial transactions. The purpose of the program is to ensure accurate measurements by public weighmasters and is accomplished by a registration/licensing function and random field inspection of weighmaster activities.

K. Electronic Retail Checkout System Program. The advent of bar coding and electronic scanners, which enter the price of a commodity into a cash register automatically rather than manual entry by a cashier, caused a need to create the process of scanner verification, or more accurately, computer verification. A representative sample of commodities is selected and run through the scanning system in the same manner a cashier would process a retail customer's order. At the conclusion, the cash register tape is compared to the stated price of the item for agreement and to determine any noncompliance or overcharges.

L. Motor Fuel Inspection Program. A program to verify that motor fuels be properly labeled at the point of retail sale. Consumers need to know the octane or cetane rating of the fuel, as well as the presence of additives, such as oxygenates. Inspectors randomly sample motor fuel dispensers to determine labeling compliance. Samples of motor fuel are taken to be analyzed in a motor fuel laboratory to determine octane or cetane levels and to determine the presence of additives and the percentages. This process determines the compliance level and helps maintain consumers confidence in their purchase of motor fuels.

M. Serviceperson/Agency Registration Program. Most states have some form of mandatory or voluntary registration requirements for service persons and service agencies for commercial weighing and measuring devices. This program is conducted primarily for the benefit of the users, manufacturers, and distributors of commercial weighing and measuring devices. The program involves accepting applications from, and issuing registration certificates to, an individual or agency, or both, that provides acceptable evidence that he, she or it is fully qualified by training or experience to install, service, repair, or recondition a commercial weighing or measuring device; has a thorough working knowledge of all appropriate weights and measures laws, orders, rules, and regulation; and has possession of or available for use, and will use, calibrated weights and measures standards and testing equipment appropriate in design and adequate in amount.

N. Type Evaluation Program. This is a program of cooperation between the National Institute of Standards and Technology (NIST), the National Conference on Weights and Measures, the States, and the private sector for determining, on a uniform basis, conformance of NIST Handbook 44 "Specifications and Tolerances and Other Technical Requirements for Weighing and Measuring Devices," NIST Handbook 105.1, Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures, Specifications and Tolerances for Field Standard Weights (NIST Class F) NIST Handbook 105.2 "Specification and Tolerances for Reference Standards and Field Standard Weights and Measures, Specifications and Tolerances for Field Standards Measuring Flask," or NIST Handbook 105.3 "Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures, Specification and Tolerances for Graduated Neck Type Volumetric

Field Standards." This program is essential to the industry in the jurisdiction to provide a level playing field and a nationally uniform standard for equipment design and construction, as well as the application thereof.

O. Training. The broad range of weighing and measuring devices and the rapidly changing technology require a professional training program for weights and measures officials to keep pace with current requirements and regulations and to be able to apply the requirements uniformly. This function is key to the success of all of the other weights and measures functions. Both the retail industry and the device service industry rely on a professional weights and measures function to conduct their competitive activities on a level playing field. Poorly trained weights and measures officials add to the cost of doing business of effected industries and reduce the efficiency of the jurisdiction's weights and measures program, and greatly reduces the ability of the service to achieve its goal of equity in the marketplace.

P. Administration. This function will vary from jurisdiction to jurisdiction according to the structure of that particular government agency. As with any effective program, professional administration is key to the success of the program. Administration includes a process for effectively resolving noncompliance issues.

Many states have other functions which are unrelated to a traditional weights and measures program which has been assigned to, and is being performed by, the weights and measures agencies.

The basic function of a weights and measures program described above all have one common goal; to provide industry with a uniform set of standards and regulations by which they may operate and to provide consumers with an assurance that the standards and regulations are being adhered to. Most states have annual sales of commodities sold by units of measure in excess of a billion dollars. Annual sales in the larger states may be one hundred billion dollars. In all states, the cost of operating a professional weights and measures program is usually less than 1/10 of 1% of that state's overall annual marketplace dollar volume. Even a moderately successful weights and measures program will have the effect of reducing marketplace measurement errors by at least 20 times the cost of the program.

The current trend to reduce the size and cost of government has opened every government function to review as a possible candidate for privatization. Discussion of privatization of weights and measures services usually centers around only one function of the service and that is the device inspection program. In a typical weights and measures program, the device inspection function may account for up to 50% of the department resources. Most weights and measures privatization efforts are based on the premise that there exists a duplication of service (device inspection) by the public and private sector and that the elimination of the duplication would increase efficiency and reduce costs. The basis for the suggestion that there is a duplication of services is apparently based on the observation that weights and measures officials inspect and test weighing and measuring devices and that private sector service persons also inspect and test weighing and measuring devices. This observation demands a closer examination to determine any duplication that may exist.

In a typical government weights and measures function, the weights and measures inspector does inspect and test weighing and measuring devices. The inspection and testing of weighing and measuring devices by weights and measures officials generally fall into three categories: initial verification, subsequent verification, and complaint investigation. Initial verification is usually at the request of the device owner and involves a new or remanufactured device being placed into service for the first time. The weights and measures inspector inspects the device to determine that the device is correct, that is, that it is appropriate for the intended use, and that the device is in compliance with design, maintenance and user requirements. The inspector then tests the device to determine the accuracy of value or performance of the equipment under examination by comparison with the actual physical standards of the official. Upon a satisfactory inspection and test of the device, the inspector places an approval seal conspicuously on the device indicating legal compliance at the time of test.

Subsequent verification by the weights and measures inspector is usually unannounced and scheduled by the weights and measures jurisdiction on a regular basis, most often annually. The basic process for inspection and test are the same for initial and subsequent verification. Complaint investigation is generally the result of a consumer complaint, but may also be the result of a competitor complaint, serviceperson complaint or even a complaint from the device owner resulting from a concern over the current accuracy of the device. The inspection and test, as the result of a complaint, may be the same process as for subsequent verification, or it may be something less depending on the nature of the complaint and the personal knowledge of the inspector regarding the device.

In all cases, the weights and measures official is acting as a third party with no financial interest in the device or the use of the device. Every state has conflict of interest laws and ethics regulations which prevent the weights and measures official from having any financial interest in the business of buying, selling or repairing weighing and measuring devices or any financial interest in the business entity which is utilizing a commercial weighing or measuring device. These laws and

regulations are intended not only to prevent any collusion or improprieties, but also the appearance of any conflict or impropriety. Third party verification of measurement accuracy has been the basis of a strong consumer confidence in marketplace accuracy for over two thousand years. Several centuries ago, when weighing and measuring devices were simple balances or measure containers, European cities would commonly have a weights and measures official who was present in the marketplace with official city scales and measures to reweigh or remeasure consumer purchases to verify measurement accuracy and to preserve a sense of order and equity in the marketplace.

As the marketplace grew so did the need for weights and measures services. Government appointed weights and measures officials would go to the several marketplaces and inspect and test the commercial weighing and measuring devices in use and to enforce the laws of equity in the marketplace. Then, as today, this service was to protect the interests of buyers and sellers alike, regardless of whether the measuring device belonged to the buyer or seller. Today's consumer is much better educated than those of past centuries. He has the ability to count, add, subtract, multiply, divide, and to understand and use algebraic formulas. However, he still does not have his own commercial weighing and measuring device and must rely on the accuracy of the device owned by the merchant and the third party verification of that device by the weights and measures official.

The private sector manufacturers sells, installs, services and maintains commercial weighing and measuring devices. Suggestions of duplication of service between weights and measures programs and the private sector center on the weights and measures device inspection function and the segment of industry that installs, services, and maintains commercial weighing and measuring devices. Let us try to examine the similarity and differences of these two functions.

The major difference is that the weights and measures function is a law enforcement activity with no financial or beneficial interest in the device or the transaction. The private sector agency is a for profit entity, selected and compensated by the device owner.

Service agencies install, service and maintain weighing and measuring devices and in the process of so doing should perform a similar, if not identical, inspection and test procedure as the weights and measures inspector to ensure that the device is in legal compliance. This is the basis for the suggestions that there is a duplication of services between the two groups. While there are similarities in procedures between the weights and measures official and the service persons, it is an error to suggest that the functions are the same. The service person, in many cases, is also an agent of the device manufacturer or distributor, as well as under contract to the device owner. His willingness to reject or condemn a device found out of compliance in these circumstances is complicated by his financial interest in his employment. His ability to adhere to a prescribed test and inspection procedure is complicated by his motivation of profit and competitiveness.

It is not uncommon for a retail company with a large number of weighing or measuring devices of a particular class, such as gasoline pumps or scales, to employ their own service technicians. The motivation of the technician in these instances is considerably different from that of the weights and measures inspector.

Most service technicians have skills and expertise limited to only a few classes of devices. Often the technician's training is limited to that of a single manufacturer of equipment. A weights and measures official is most often trained to be able to inspect and test the full range of weighing and measuring devices. The major reason for this is that the training for the weights and measures official is limited to the inspection and testing process, while the service technician must also be trained in maintenance and repair technology. A typical supermarket today might have 30-50 commercial retail scales. Typically, all of the scales would be inspected by a single weights and measures official. Service and maintenance of this equipment, however, would typically be provided by three to five different service agencies. In the State of New Hampshire, which has "privatized" the device inspection function of weights and measures, costs to the retailer have risen dramatically for device inspection services. There are many small retail outlets throughout the state which typically include retail grocery sales, gasoline sales, propane sales and hardware sales. All of the commercial weighing and measuring devices in these outlets were annually inspected by a single weights and measures official inspector when the State provided the service. Today, this same retailer must obtain this service from up to five different service agencies. There simply does not exist any private sector equivalent of a weights and measures inspector. There does exist a large network of private sector agencies that have found their niche in the marketplace. A service agency that might offer maintenance and repair service to the retail gasoline industry typically does not offer this service to the retail fuel oil delivery company or the retail propane delivery dealer. The service agencies that maintain and repair supermarket scanner scales typically do not maintain or repair deli, meat or produce scales. Because of the high costs of training, test equipment, parts inventory and arrangements with distributors and manufacturers, service agencies tend to concentrate on their marketplace niche.



Transferring the weights and measures device inspection responsibility to the private sector service industry is technically possible. The service industry is, or should be, very capable of performing an official inspection and test on the commercial weighing and measuring devices they maintain and repair. However, to suggest that this transfer of responsibility is designed to reduce or eliminate duplication of effort, reduce costs, or improve efficiency is false. While costs to government agencies may be reduced, costs to the retail industry will skyrocket. Third party verification is eliminated and, along with this, is an erosion of consumer confidence in the marketplace. The retailer's relationship with the service industry will also change.

When in the past, a weights and measures official would reject or condemn a weighing or measuring device for noncompliance, the retailer would contact a service agency for repair or replacement of the equipment with reasonable confidence in the decision of the inspector and the advice of the service agency. When a device is rejected by a service agency who also happens to have several expensive components, or even a new device that he can sell the retailer to get the retailer's equipment back in business, the confidence starts to erode and the entire process becomes a little suspicious. Third party verification also has a significant benefit to the retailer in this process.

What about the cost reduction benefits to government? Earlier we identified the device inspection function of a weights and measures program as something less than 50% of the program resources and costs. Would the transferring of this function to the private sector save the government 50% of the weights and measures costs? Proposals to "privatize" device inspection usually include a proposal for a device inspection audit program. Instead of inspection and testing of all of the devices each year, the idea is to inspect and test a portion, usually about 20% of the devices, each year as an audit function to ensure that the private sector's service industry is conducting the inspection and tests according to the legal requirements and to maintain some third party verification. If we test only 20% of the devices annually, will we then save 80% of the program costs? By conducting a random sample of the devices within the state instead of all the devices the cost per inspection will increase because of travel time costs. When inspecting 100% of the devices, the inspector would be assigned a geographic area to minimize travel time and costs. By reducing the total number of devices tested a jurisdiction will have to greatly expand the geographic area for the inspector.

We must also remember that one component of the device inspection program is complaint investigation. "Privatizing" this aspect of the program is not feasible, so the cost of this function is also retained, however, the cost of this will increase for the same geographic reasons as the audit.

A portion of the device inspection program costs of a weights and measures program is also clerical. These costs generally will increase because the private sector is required in a "privatization" effort to send their official test reports to the weights and measures agency for review.

Most "privatization" proposals also require that all service agencies and service persons pay a fee to the state and obtain a license or registration annually. This licensing or registration function will generate additional revenue for the state, but it will also increase the clerical responsibility of the agency and the cost of clerical services.

A close scrutiny of the real costs of a weights and measures "privatization" effort will show a slight reduction in the cost to government while corresponding costs to retailers increase eight to ten times. While experiencing dramatic increases in their costs retailers will also have to deal with the erosion of confidence. The erosion of confidence develops between the retailer and the service agency and the consumer and the retailer, as well as between the retailer and his competition. The level playing field benefit of state weights and measures function is also reduced in this proposal. No business likes government regulation. Complying with any regulation has a cost and the cost is especially painful if you as a business person are paying that cost and you suspect that a competitor is not.

Much has been said recently about government maintenance of our infrastructure. Observations have been made that we as a nation are more concerned with today than we are with tomorrow. Leading economists have suggested that personnel saving is down, spending on capital improvements by the private sector is down, and government spending and maintenance of infrastructure is down. If these observations are true, and they certainly appear to be true, our fiscal problems will be even greater tomorrow.

Weights and measures services are our marketplace infrastructure. The strength of tomorrow's marketplace depends on today's maintenance of that infrastructure. Changes to the methods of providing weights and measures services should be carefully reviewed to ensure that the marketplace infrastructure is maintained or improved by the changes. Proposed changes in the delivery of traditional weights and measures services must carefully address conflict of interest issues and marketplace confidence concerns. Costs must be reviewed not only with an eye towards government costs, but also with a review of the costs to the retail industry, the service industry, and to the consumer.

Any review of weights and measures services should include an audit or review of the current conditions in a state. The audit should identify the beneficiaries of weights and measures services and the type of services that are needed. After identifying what services are needed and the benefits, the audit should identify all of the options for providing the service. Each option should be carefully reviewed to determine the most effective and efficient method to deliver the service. Proposals to change components of a weights and measures function which do not closely examine the effects the changes will have on remaining services are short sighted.

John Quincy Adams, in a remark made to the Senate in 1821, stated "Weights and measures may be ranked among the necessities of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family and are necessary to every transaction of trade and commerce." These remarks are still true today and emphasize the importance of maintaining a weights and measures service delivery system that meets the need of every individual of human society.



### National Data Sharing

by N. David Smith, North Carolina

Unless the "as found" condition of weights and measures devices is documented, it is impossible to accurately determine the operating condition of devices in a jurisdiction. The usual listing of rejection rates is of little value if scales and meters are zeroed and adjusted before testing. It is likely historical rejection rates are in fact under reported. To correct this situation, it is desirable to document "as found" conditions. This activity, however, does have a few drawbacks:

- a. Inspectors must be retrained and reporting forms modified.
- b. More time must be allocated to perform inspections and this additional time means fewer devices will be inspected.
- c. With fewer devices being inspected, inspection totals, when compared to prior time periods, may falsely indicate that inspection activity has declined.
- d. Program resources (fees), if directly tied to the number of inspections performed, will suffer since the number of inspections is down.

Yet, the value of "as found" reporting is too great not to pursue. Such reporting, coupled with a national reporting form, could provide valuable information on evaluating the effectiveness of individual jurisdictions, identifying types and models of devices with excessive rejection rates, and documenting the true economic value of an effective weights and measures program.

What information must be collected and how should it be documented? By necessity, the extra documentation must not be extensive if weights and measures jurisdictions are required to alter their routines to capture the needed information. In addition, the information must be available in the course of routine inspections so that the impact on historical inspection rates will be minimal. Since weights and measures jurisdictions follow Handbook 44 procedures, the logical action is to incorporate those procedures on a national or standardized reporting form. Suggested "as found" documentation is:

- a. For all devices, the condition of the device (scale on zero, meter on zero, etc.) immediately prior to the inspection routine.
- b. For all devices not at zero, the amount of the error (plus and minus).
- c. For small commercial scales, the error at one and five pound loads.
- d. For all other scales, the largest error at any point in the test procedure.
- e. For any meter, the error at the testing volume.

Of course, the amount of error provides limited information unless an economic value is placed on the error. For many commodities, the value of the commodity being measured is easy to obtain, but for others, it is much more difficult to document since many commodities may be weighed on a single scale or various prices may be charged depending on the quantity purchased. In some instances, the merchant may not want to reveal prices being paid for particular commodities. In any event, securing commodity value information must not become an adventure requiring lengthy amounts of time to procedure.

Perhaps commodities can be put in broad categories, such as:

- a. construction materials
- b. grain and feed
- c. forest products
- d. petroleum products
- e. retail motor fuels
- f. and so on - this list could become endless but it must be kept to a manageable number since a simple check off form (or code) is desirable.

Therefore, it is imperative that the sought after information be limited to: "as found" information, commodity being measured and its value, and perhaps information on the weighing or measuring device. (The latter could be controversial since competitive forces could use the information to discredit a competitor.)

Unless NIST is in the position to equip weights and measures jurisdictions (or at least a few jurisdictions) with portable computers, the transfer of computer technology to field inspections will be very slow. A more likely prospect is a software program to capture inspection information from the paper reports sent to a central office. Of course, the paper reports or inspection forms must be standardized so everyone is reporting the same information.

NIST computer specialists should be able to design the appropriate software programs for distribution to jurisdictions with capable computer hardware. However, the field information must be entered into the computer and this takes resources which may not be available to many jurisdictions.

Once captured, the information can be shared in a variety of ways. With the increasing popularity of electronic communication (e-mail), large volumes of data can quickly be distributed.

#### HOW DO WE FUND PACKAGE TESTING AND UNDERCOVER PURCHASES?

No weights and measures program is complete unless it has the resources to perform package inspections and respond to complaints. Simply testing devices ignores a significant portion of the commercial transaction. For example, is the cash discount computed correctly; are products sold from bulk deliberately misweighed; are packaged products misweighed for weekend sales; are merchants remotely manipulating the accuracy of motor fuel dispensers; and are vendors cheating sellers by short weighing commodities? In most cases which come to the attention of weights and measures officials, citizens suspect they have been cheated and report it to the authorities. When people are being deliberately cheated, it doesn't do any good to test the weighing or measuring device and in fact, responding to the complaint by just testing the device may discourage complaints. People sense when government is adequately responding to their complaints and quickly lose confidence when inadequate measures are taken. It is imperative that a weights and measures program has sufficient resources to conduct routine package inspections and respond to consumer complaints even if it means that undercover purchases must be made.

Ideally, package inspection and undercover investigations are funded through general revenue sources along with device inspections. When device inspections are supported through fees, there is great temptation to restrict inspection activities to those areas generating the fees. Since package inspections and undercover investigations do not generate any fees, they are usually left out of the weights and measures equation. Such thinking is short sighted for a complete weights and measures program encompasses certain activities, regardless of the sources of funding.

## Inspection Sampling

by Chip Kloos, Hunt-Wesson

Inspection sampling is not a new concept. It is used whenever there are more items to be inspected than there is time or resources available to inspect them. It is used most frequently in the area of package inspection.

However, when it comes to device inspection, the owners of the devices as well as the inspectors themselves expect every device to be inspected periodically. But in this time of diminishing resources, sampling may be the answer to maintaining responsibility without having to resort to 100 percent inspection.

### Objectives of Sampling

Sampling can be used to achieve two different objectives. The most common and obvious use of sampling for regulatory officials is for the purpose of obtaining information to make compliance decisions. This is called acceptance sampling and is used to make pass (acceptance) or fail (rejection) decisions. This approach could be applied to devices where individual establishments, such as a trailer park or gasoline service station, are responsible for maintaining their devices. When an establishment is being inspected, not every device needs to be evaluated in order to reach a compliance decision. Only a representative sample would be required.

The second objective that sampling could achieve is that of estimation. Instead of a pass or fail decision, sampling can be used to estimate the compliance level of devices within a jurisdiction. Again, 100 percent inspection is not necessary to obtain an accurate estimate of the compliance level.

### Acceptance Sampling

Acceptance sampling is based on the premise that repeated samples will be taken periodically. If sampling rather than 100% inspection is performed, the frequency of inspection could be increased where needed. This approach to sampling can be applied to individual establishments, to package lots, or to device types where compliance is required.

There are basically two different types of acceptance sampling plans: attribute plans and variable plans. With attribute sampling plans, each device or item inspected would be tested to see whether or not it complied with the requirement(s). The acceptance of the establishment (lot) would be based on the number of non-complying items found in the sample. Actual measurement of each device is not required (though usually performed), only whether it complies or not is recorded. Since there are no quantifying measurements that accompany each observation, relatively large samples are required to achieve the desirable level of confidence associated with the compliance decision. Basically, each device would be tested to see if it possesses the desired attribute of compliance or not, e.g., pass/fail, go/no-go or nondefective/defective only.

Variable sampling plans would require a measurement to be made in order to determine the compliance of each device. In this case, each observation would have more information (the variable) on how good or bad it is. Smaller sample sizes are required when compared to attribute plans with the same level of confidence because of this added information.

Examples of both types of acceptance sampling plans are shown below. An attribute sampling plan based on Military Standard Plan 105D (MIL-STD-105D) is illustrated in Table 1. An example of a variable sampling plan based on Military Sampling Plan 414 (MIL-STD-414) is shown in Table 2. It is interesting to note that the attribute plan required a sample size of 13 while the variable plan required only 5 items and both reach the same conclusion. Tables referenced in both examples are found in the Appendix.

You will note that both types of plans provide for a variety of inspection levels. In Mil-Std-105D, there are four Special levels (S-1 to S-4) and three General levels (I - III) shown in Table I of the plan. Although General level II is traditionally used, General level I could be used for typically good establishments and General level III could be used for poorer establishments if you want to vary the intensity of inspection. Similarly, Mil-Std-414 has five inspection levels (I - V) shown in Table A-2 of the plan. Although level IV is used most often, the levels can also vary accordingly.

The Acceptable Quality Level (AQL) is the defect level or percent noncompliance typically associated with high quality. It is the defect level that has approximately a 95 percent chance of passing the inspection. In the above examples where the AQL is 4.0 percent, if a station had 4.0 percent of its pumps out of compliance, there is approximately a 95 percent chance that it would pass the inspection. It is equivalent to the highway (good) mileage shown on a new car sticker. There is another aspect of the plan called the Reject Quality Level (RQL). This is the defect level that has approximately only a 10 percent chance of passing. In the plan shown in Table 1, the RQL is 26.8 percent. That is, if the station had 26.8 percent

of its pumps out of compliance, it would have approximately a 10 percent chance of passing the inspection. The RQL is equivalent to the city (bad) mileage on a new car sticker. These quantities, the AQL and RQL for each plan, can be read off the Operating Characteristic Curves (O-C Curves) contained in the Mil-Std Handbooks.

One other feature of the acceptance sampling plans contained in Mil-Std 105D and Mil-Std-414 are the switching rules. For a given level of inspection, the sample size and acceptance criteria can be changed in accordance with consistently good or poor establishments (just like with production lots). The rules are shown in Figure 1 and indicate that the requirements can be relaxed or reduced when an establishment consistently passes inspections or tightened when it fails some of the inspections. Realize that the sampling plans and switching rule generally apply to continuous manufacturing processes where production lots are being continuously inspected. It is a bit of a jump in going from a continuous manufacturing process to a group of gas stations located within a jurisdiction that is inspected once every year or so, but the methods are quite suitable.

**TABLE 1. ATTRIBUTE SAMPLING PLAN  
(MIL-STD-105D)**

<u>PROCEDURE</u>	<u>EXAMPLE</u>
1. Determine the total number of devices subject to inspection.	1. Assume a gas station has 30 pumps subject to inspection.
2. Determine the appropriate sample size code letter from Table I in the Appendix. Look under Lot Size for the total number and use General Inspection Level II.	2. For a total of 30 pumps, the sample size code letter would be D.
3. Define the Acceptable Quality Level (AQL).	3. An Acceptable Quality Level of 4.0% is desired.
4. Determine the appropriate sampling plan for the desired sample size code letter and AQL from Table II-A. This will include the definition of the sample size and the accept/reject criteria.	4. The sample size code letter D would require 8 pumps to be inspected. However, an AQL of 4.0% requires that code letter E and a sample size of 13 pumps be used. The station would be accepted (pass) if no more than 1 pump ( $A_c = 1$ ) was found to be defective and the station would be rejected (fail) if 2 or more pumps ( $R_e = 2$ ) were found to be defective.
5. Determine if each pump, as found, is in compliance (is non-defective).	5. Using a five gallon prover and tolerance limits of 6 cubic inches ( $\text{in}^3$ ), the results showed errors of -3, +5, -6, -2, +3, +3, -7, +5, -3, -7, +4, +2 and -2 $\text{in}^3$ .
6. Determine whether the station passes or fails the inspection.	6. Since two of the 13 pumps exceeded the tolerance limits of $\pm 6 \text{ in}^3$ , the station failed the inspection.

**TABLE 2. VARIABLE SAMPLING PLAN  
(MIL-STD-414)**

<u><b>PROCEDURE</b></u>	
<ol style="list-style-type: none"> <li>1. Determine the total number of devices subject to inspection.</li> <li>2. Determine the appropriate sample size code letter from Table A-2 in the Appendix. Look under Lot Size for total number and use Inspection Level IV.</li> <li>3. Determine the Acceptable Quality Level (AQL).</li> <li>4. Determine the appropriate sampling plan for the desired sample size code letter and AQL from Table B-3.</li> <li>5. Measure the error of each pump as found.</li> <li>6. Calculate the average and standard deviation of the errors.</li> <li>7. Calculate the number of standard deviations each tolerance limit is from the sample average.</li> <li>8. Estimate the total percent defective pumps (percent of pumps estimated to exceed the tolerance limits) based on how far (how many standard deviations) each tolerance limit (<math>Q_U</math> and <math>Q_L</math>) is from the sample average using Table B-5.</li> <li>9. Determine whether the station passes (est. % defective <math>\leq M</math>) or fails (est. % defective <math>&gt; M</math>) inspection.</li> </ol>	



## Sampling for Estimation Purposes

If, instead of acceptance sampling, your objective is to accurately estimate the compliance level of devices within a jurisdiction, a simpler sampling plan can be used. For estimation purposes, you want a sample that is large enough to be representative of the population of devices under consideration and reasonably accurate. The simplest approach is based on the assumption that the population is fairly homogeneous, i.e., not made up of groups that are distinctly different with regard to compliance level. It utilizes the principle of random sampling where each device in the population has an equal chance of being included in the sample. The size of the sample is based on the total number of devices in the population, the estimated compliance level and how accurate you want the estimate to be. This would be a good approach to doing a marketplace survey to determine the level of equity in the marketplace at the time of the survey.

Table 3 below shows the sample sizes needed to estimate the percent compliance for population sizes ranging from 10 devices to infinity (a whole lot). The sample sizes are based on the assumption that the level of compliance is approximately 95 percent or 90 percent and the desired level of accuracy (error of the estimate) is either 1 percent or 5 percent. The table shows that if the level of compliance is lower (90% vs. 95%), the sample size increases. The reason is that with more non-complying (defective) devices, you would need to do more sampling than you would if there were fewer non-complying devices in order to achieve an accurate estimate of the compliance level. Similarly, if the desired level of accuracy is high (1% error of the estimate vs. 5%), the sample size would also need to be increased. It is interesting to note that for a population size greater than 10,000, the sample size does not change that much, particularly with a 5 percent error of the estimate.

If the assumption of homogeneity of the population is not valid and there are distinctly different levels of compliance with different establishments or device manufacturers, a stratified sampling plan would be more appropriate. In this case, for example, let's say there are two distinct levels of compliance: good establishments or devices and poor establishments or devices. The population would be segregated (stratified) into the two groups (good and poor) and a reduced sample size applied to the good group and an increased sample size applied to the poor group.

Another type of sampling called cluster sampling should also be considered. When faced with a large territory to cover, it may be inconvenient to try to sample the entire state or jurisdiction with equal coverage. Rather than covering 100 percent of the territory, randomly select counties or subsections within the jurisdiction (clusters) and extensively sample within these clusters. That way, not all areas within the jurisdiction will be sampled but, as long as each section or cluster has an equal chance of being selected for inspection, you will obtain a valid estimate of the compliance level. The advantage associated with cluster sampling is that you can concentrate your efforts in fewer areas (perhaps those needing special attention), thus being more thorough, while at the same time minimizing the amount of necessary travel time.

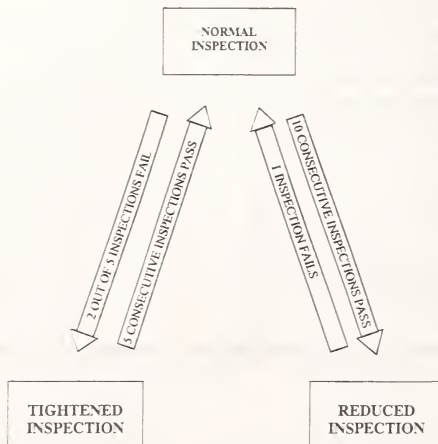


Figure 1. Switching Rules

**Table 3. Sample Sizes (n) needed to Estimate Percent Compliance**

Total No. of Devices (N)	Estimated Compliance Level (p)			
	95%		90%	
	Error of the Estimate (e)			
	1%	5%	1%	5%
10	49	9	10	10
25	25	19	44	22
50	49	31	50	38
100	96	44	98	60
500	396	67	440	112
1,000	656	71	783	126
5,000	1,378	75	2,094	140
10,000	1,597	76	2,648	142
50,000	1,831	76	3,359	144
100,000	1,865	76	3,475	144
∞	1,900	76	3,600	144

$$n = 4Np(1-p) / ((N-1)e^2 + 4p(1-p))$$

Examples of both stratified sampling and cluster sampling schemes can be developed. However, the move from 100 percent inspection to random sampling should be digested first before moving to the more complicated sampling designs.

Additional questions beyond the scope of this introduction to sampling must also be considered. These might include the effect of charging fees for devices that are not inspected, the impact of longer periods between inspections at the same establishments or for the same devices and keeping track of those devices not yet inspected.

Sampling definitely adds another level of complexity to inspection. However, it is the only practical way to maintain responsibility over a wide area and a large number of devices with diminishing resources.

**MIL-STD-105D**

29 April 1963

**SUPERSEDING**

**MIL-STD-105C**

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18 July 1961

**MILITARY STANDARD**

**SAMPLING PROCEDURES AND TABLES**

**FOR INSPECTION BY ATTRIBUTES**



**TABLE I--Sample size code letters***(See 9.2 and 9.3)*

Lot or batch size			Special inspection levels				General Inspection levels		
			S-1	S-2	S-3	S-4	I	II	III
2	to	8	A	A	A	A	A	A	B
9	to	15	A	A	A	A	A	B	C
16	to	25	A	A	B	B	B	C	D
26	to	50	A	B	B	C	C	D	E
51	to	90	B	B	C	C	C	E	F
91	to	150	B	B	C	D	D	F	G
151	to	280	B	C	D	E	E	G	H
281	to	500	B	C	D	E	F	H	J
501	to	1200	C	C	E	F	G	J	K
1201	to	3200	C	D	E	G	H	K	L
3201	to	10000	C	D	F	G	J	L	M
10001	to	35000	C	D	F	H	K	M	N
35001	to	150000	D	E	G	J	L	N	P
15001	to	500000	D	E	G	J	M	P	Q
50001	and	over	D	E	H	K	N	Q	R

CODE  
LETTERS

TABLE II-A--Single sampling plans for normal inspection  
(Master table)

See 9.4 and 9.5

SINGLE  
NORMAL

Sample size code letter	Acceptable Quality Levels (normal inspection)																									
	0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile	Ac Ile
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Use first sampling plan below arrow If sample size equals, or exceeds, lot or batch size, do 100 percent inspection.  
Use first sampling plan above arrow  
Ac = Acceptance number.  
Ile = Inspection number.



**MIL-STD-414**

11 June 1957

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SUPERSEDING

ORD-M608-10

June 1954

NAVORD OSTD 80

8 May 1952

## **MILITARY STANDARD**

# **SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY VARIABLES FOR PERCENT DEFECTIVE**



## Executive Committee

TABLE A-2 Sample Size Code Letters<sup>1</sup>

Lot Size	Inspection Levels	
	II	I V
3 to	8	B B B B C
9 to	15	B B B B D
16 to	25	B B B C E
26 to	40	B B B D F
41 to	65	B B C E G
66 to	110	B B D F H
111 to	180	B C E G I
181 to	300	B D F H J
301 to	500	C E G I K
501 to	800	D F H J L
801 to	1,300	E G I K L
1,301 to	3,200	F H J L M
3,201 to	8,000	G I L M N
8,001 to	22,000	H J M N O
22,001 to	110,000	I K N O P
110,001 to	550,000	I K O P Q
550,001 and over		I K P Q Q

<sup>1</sup>Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

Table B-3

Standard Deviation Method

Master Table for Normal and Tightened Inspection for Plans Based on Variability Unknown  
(Double Specification Limit and Form 2--Single Specification Limit)

Sample size code letter	Sample size	Acceptable Quality Levels (normal inspection)													
		.04	.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00
		M	M	M	M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69	40.47	
C	4	↓	↓	↓	↓	↓	↓	1.53	5.50	10.92	16.45	22.86	29.45	36.90	
D	5	↓	↓	↓	↓	↓	↓	1.33	3.32	5.83	9.80	14.39	20.19	26.56	
E	7	↓	↓	↓	↓	0.422	1.06	2.14	3.55	5.35	8.40	12.20	17.35	23.29	
F	10	↓	↓	↓	0.349	0.716	1.30	2.17	3.26	4.77	7.29	10.54	15.17	20.74	
G	15	0.099	0.186	0.312	0.503	0.818	1.31	2.11	3.05	4.31	6.56	9.46	13.71	18.94	
H	20	0.135	0.228	0.365	0.544	0.846	1.29	2.05	2.95	4.09	6.17	8.92	12.99	18.03	
I	25	0.155	0.250	0.380	0.551	0.877	1.29	2.00	2.86	3.97	5.97	8.63	12.57	17.51	
J	30	0.179	0.280	0.413	0.581	0.879	1.29	1.98	2.83	3.91	5.86	8.47	12.36	17.24	
K	35	0.170	0.264	0.388	0.535	0.847	1.23	1.87	2.68	3.70	5.57	8.10	11.87	16.65	
L	40	0.179	0.275	0.401	0.566	0.873	1.26	1.88	2.71	3.72	5.58	8.09	11.85	16.61	
M	50	0.163	0.250	0.363	0.503	0.789	1.17	1.71	2.49	3.45	5.20	7.61	11.23	15.87	
N	75	0.147	0.228	0.330	0.467	0.720	1.07	1.60	2.29	3.20	4.87	7.15	10.63	15.13	
O	100	0.145	0.220	0.317	0.447	0.689	1.02	1.53	2.20	3.07	4.69	6.91	10.32	14.75	
P	150	0.134	0.203	0.293	0.413	0.638	0.949	1.43	2.05	2.89	4.43	6.57	9.88	14.20	
Q	200	0.135	0.204	0.294	0.414	0.637	0.945	1.42	2.04	2.87	4.40	6.53	9.81	14.12	
		.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00	
Acceptability Quality Levels (tightened inspection)															

All AQL and table values are in percent defective.

↓ Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

**TABLE B-5--Continued**  
 Table for Estimating the Lot Percent Defective Using Standard Deviation Method

$Q_U$ or $Q_L$	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
1.10	9.84	13.33	13.48	13.49	13.50	13.51	13.52	13.52	13.53	13.54	13.54	13.54	13.55	13.55	13.56	13.56
1.11	8.89	13.00	13.20	13.25	13.26	13.28	13.29	13.30	13.31	13.31	13.32	13.32	13.33	13.34	13.34	13.34
1.12	7.82	12.67	12.93	13.00	13.03	13.05	13.07	13.08	13.09	13.10	13.10	13.11	13.12	13.12	13.12	13.13
1.13	6.60	12.33	12.65	12.75	12.80	12.83	12.85	12.86	12.87	12.88	12.89	12.89	12.90	12.91	12.91	12.92
1.14	5.08	12.00	12.37	12.51	12.57	12.61	12.63	12.65	12.66	12.67	12.67	12.68	12.69	12.70	12.70	12.70
1.15	0.29	11.67	12.10	12.27	12.34	12.39	12.42	12.44	12.45	12.46	12.46	12.47	12.48	12.49	12.49	12.50
1.16	0.00	11.33	11.83	12.03	12.12	12.18	12.21	12.22	12.24	12.25	12.25	12.26	12.28	12.28	12.29	12.29
1.17	0.00	11.00	11.56	11.79	11.90	11.96	12.00	12.02	12.03	12.04	12.05	12.06	12.07	12.08	12.08	12.09
1.18	0.00	10.67	11.29	11.56	11.68	11.75	11.79	11.81	11.82	11.84	11.84	11.85	11.87	11.88	11.88	11.89
1.19	0.00	10.33	11.02	11.33	11.46	11.54	11.58	11.61	11.62	11.63	11.64	11.65	11.67	11.68	11.69	11.69
1.20	0.00	10.00	10.76	11.10	11.24	11.34	11.38	11.41	11.42	11.43	11.44	11.46	11.47	11.48	11.49	11.49
1.21	0.00	9.67	10.50	10.87	11.03	11.13	11.18	11.21	11.22	11.24	11.25	11.26	11.28	11.29	11.30	11.30
1.22	0.00	9.33	10.23	10.65	10.82	10.93	10.98	11.01	11.03	11.04	11.05	11.07	11.09	11.09	11.10	11.11
1.23	0.00	9.00	9.97	10.42	10.61	10.73	10.78	10.81	10.84	10.85	10.86	10.88	10.90	10.91	10.91	10.92
1.24	0.00	8.67	9.72	10.20	10.41	10.53	10.59	10.62	10.64	10.66	10.67	10.69	10.71	10.72	10.73	10.73
1.25	0.00	8.33	9.46	9.98	10.21	10.34	10.40	10.43	10.46	10.47	10.48	10.50	10.52	10.53	10.54	10.55
1.26	0.00	8.00	9.21	9.77	10.00	10.15	10.21	10.25	10.27	10.29	10.30	10.32	10.34	10.35	10.36	10.37
1.27	0.00	7.67	8.96	9.55	9.81	9.96	10.02	10.06	10.09	10.10	10.12	10.13	10.16	10.17	10.18	10.19
1.28	0.00	7.33	8.71	9.34	9.61	9.77	9.84	9.88	9.90	9.92	9.94	9.95	9.98	9.99	10.00	10.01
1.29	0.00	7.00	8.46	9.13	9.42	9.58	9.65	9.70	9.72	9.74	9.76	9.78	9.80	9.82	9.83	9.83
1.30	0.00	6.67	8.21	8.93	9.22	9.40	9.48	9.52	9.55	9.57	9.58	9.60	9.63	9.64	9.65	9.66
1.31	0.00	6.33	7.97	8.72	9.03	9.22	9.30	9.34	9.37	9.39	9.41	9.43	9.46	9.47	9.48	9.49
1.32	0.00	6.00	7.73	8.52	8.85	9.04	9.12	9.17	9.20	9.22	9.24	9.26	9.29	9.30	9.31	9.32
1.33	0.00	5.67	7.49	8.32	8.66	8.86	8.95	9.00	9.03	9.05	9.07	9.09	9.12	9.13	9.15	9.15
1.34	0.00	5.33	7.25	8.12	8.48	8.69	8.78	8.83	8.86	8.88	8.90	8.92	8.95	8.97	8.98	8.99
1.35	0.00	5.00	7.02	7.92	8.30	8.52	8.61	8.66	8.69	8.72	8.74	8.76	8.79	8.81	8.82	8.83
1.36	0.00	4.67	6.79	7.73	8.12	8.35	8.44	8.50	8.53	8.55	8.57	8.60	8.63	8.65	8.66	8.67
1.37	0.00	4.33	6.56	7.54	7.95	8.18	8.28	8.33	8.37	8.39	8.41	8.44	8.47	8.49	8.50	8.51
1.38	0.00	4.00	6.33	7.35	7.77	8.01	8.12	8.17	8.21	8.24	8.25	8.29	8.31	8.33	8.35	8.35
1.39	0.00	3.67	6.10	7.17	7.60	7.85	7.96	8.01	8.05	8.08	8.10	8.12	8.16	8.18	8.19	8.20
1.40	0.00	3.33	5.88	6.98	7.44	7.69	7.80	7.86	7.90	7.92	7.94	7.97	8.01	8.02	8.04	8.05
1.41	0.00	3.00	5.66	6.80	7.27	7.53	7.64	7.70	7.74	7.77	7.79	7.82	7.86	7.87	7.89	7.90
1.42	0.00	2.67	5.44	6.62	7.10	7.37	7.49	7.55	7.59	7.62	7.64	7.67	7.71	7.73	7.74	7.75
1.43	0.00	2.33	5.23	6.45	6.94	7.22	7.34	7.40	7.44	7.47	7.50	7.52	7.56	7.58	7.60	7.61
1.44	0.00	2.00	5.01	6.27	6.78	7.07	7.19	7.26	7.30	7.33	7.35	7.38	7.42	7.44	7.46	7.47
1.45	0.00	1.67	4.81	6.10	6.63	6.92	7.04	7.11	7.15	7.18	7.21	7.24	7.28	7.30	7.31	7.33
1.46	0.00	1.33	4.60	5.93	6.47	6.77	6.90	6.97	7.01	7.04	7.07	7.10	7.14	7.16	7.18	7.19
1.47	0.00	1.00	4.39	5.77	6.32	6.63	6.75	6.83	6.87	6.90	6.93	6.96	7.00	7.02	7.04	7.05
1.48	0.00	0.67	4.19	5.60	6.17	6.48	6.61	6.69	6.73	6.77	6.79	6.82	6.86	6.88	6.90	6.91
1.49	0.00	0.33	3.99	5.44	6.02	6.34	6.48	6.55	6.60	6.63	6.65	6.69	6.73	6.75	6.77	6.78

### Accreditation Program

by Sidney Colbrook, Illinois

Whenever we have a weights and measures meeting, it seems that we talk about how we need to make our programs more uniform, however, it never gets done. We see standards adopted by the Conference to Handbooks 44, 130, and 133, which should make our inspection procedures more uniform. I believe that we have less uniformity when certain requirements are adopted because many jurisdictions do not intend to follow through enforcing Conference action. An accreditation program may be the answer.

We began this process several years ago. A few jurisdictions were evaluated. It is my understanding that it was then determined a training program with modules must be created in order to establish the "tools" for evaluating a program. Now we have developed and implemented training modules. Training programs have been conducted for each of the modules developed. Now perhaps it is time to look at an accreditation program for weights and measures programs.

In the Central, we asked the states how they were testing devices. Procedures being used were in some ways rather uniform. We prepared an overview of each state in a generic form to show some basic discrepancies of the way devices were being inspected and tested.

The Central group supports in principle an accreditation program. Industry came forward supporting the program. We plan to initially evaluate a couple of the programs. Such evaluation will consist of reviewing first procedures manuals, laws, regulations, test reports, computer printouts of inspection results, and other documents such as documents for quality to get a feel for the program. Then later, testing equipment would be used in the field to determine the effects of the program. I cannot give you many specifics of the program because the program is just being developed.

As I see it, the program will accomplish at least five major objectives which are:

1. It will promote uniform testing procedures.
2. It will raise the need for more training to educate administrators and field staff.
3. It will establish a standard similar to our metrology accreditation program which will assist directors in supporting their programs. The program then may be used to increase the level of the program which would result in a higher pay scale for weights and measures and a more qualified staff.
4. Device manufacturers and packagers will benefit from this program because uniform testing procedures will be used.
5. Peer pressure will eventually force jurisdictions to buy into the program. Programs will change and be updated to maintain their accreditation. Conference action will have more impact than now, and perhaps it will make representatives at the Conference to be more knowledgeable and responsible when action is taken.

If the program is successful, it will accomplish what most have been saying for years and that is we must become more uniform in what we do. Tom Stabler was very supportive and wants to be involved in this pilot program. The Central wants industry to play an active role during the developmental and implementation stages. We also will be cautious to insure any results will not damage a program or manufacturer. We plan to result the progress of our plan to the National Executive Committee. Our plan will be modeled after the earlier plan considered at the NCWM. We expect to, in a smaller region, go through the "growing pains" associated with developing such a program. When it becomes more of a finished product, the NCWM may want to use the program as a national program. This program has the potential of being one of the most important programs ever developed. If we do not get our houses in order, some day some one will do it for us.

## National Data Sharing

by Sidney Colbrook, Illinois

National data sharing is difficult to address because by collecting data we must be uniform in the processes, systems, and procedures used. Before we go any further, two major problems exist.

1. Lack of uniform testing procedures where we would be comparing apples to oranges, and
2. The method (types of information) and systems used must be compatible to enter into a national database sharing network.

Our agency has spent thousands of dollars in creating and developing our weights and measures computer system. Our recent change of going from Nomad to Paradox has taken a year to accomplish. Changing computer programs is no easy task.

What do we need? I believe we need a database network to monitor devices and packages to determine what is and what is not in compliance. For noncompliance packages, this would allow jurisdictions to focus their programs on those products found not to conform with the requirements of HB-130 and HB-133. For weighing and measuring devices, this program would allow NTEP to focus in on insuring that production equipment is conforming to type.

Concerns to the results would be how this information may be made public and could be used against either a device manufacturer or product packager. The legality of supplying this information must be researched.

One of the questions asked is can the WAMIS program be used. It seems to me that WAMIS is currently underutilized. Our computer gurus have informed me that we must now take a computer off of our network to be used for contacting outside programs because of the potential of viruses being introduced into our system. This will not be a problem because data can be downloaded from our system into the off-line computer, and then this information may be transferred into the WAMIS program. In answer to the question proposed, I believe WAMIS can be used. It needs to be made more computer friendly and more widely used.

I believe NIST should provide the technical support to each jurisdiction in developing and implementing a generic computer system. In order for this program to be successful, it must be friendly and convenient to the user. It should take just the mechanics of downloading from one system to another. Jurisdictions I do not believe will manually enter any collected data. It must be accomplished by downloading already captured information. It should be NIST's responsibility to tell us what type of hardware and software to use. It is expensive for each jurisdiction to develop its own program and it will lead to nonuniformity. Programs can be personalized for the jurisdiction using the programs. The hardware must be able to withstand hostile environments.

Now is the time to develop a generic computer program. Many jurisdictions have already or are in the process of implementing computers and computer programs in the field. We plan to purchase at least two computers after July for field use. Let's get ahead of the game by having the programs available before too many jurisdictions have differing programs and software. One thing we have to remember, we will always be outdated with computer software programs. We must bite the bullet and go with what is best at the time.

Let's develop a national database and let's do it now. This database will be useful to support our existing programs. The time to act is now!



## Industry's Perspective

by Daryl Tonini, Scale Manufacturers Association

The following represents the report developed by Daryl Tonini, Scale Manufacturers Association (SMA). It is not a formal SMA position, but represents a mainstream position among the many company representatives with whom he has discussed the issue.

1. What is industry's role in helping to deliver an effective W&M program? What role should industry play with respect to education (training) of inspectors and industry service personnel?
2. What tools are needed to insure the integrity of tests performed by industry service personnel?
3. What constitutes a "strong" program for:
  - a. registration of service persons;
  - b. notification of device repairs; and
  - c. revocation/suspension of licenses for poor or inadequate performance by service persons/agencies?

### DISCUSSION:

One of the most effective roles that industry has in delivery of an effective W&M program is through participation in the National Conference on Weights and Measures (NCWM). Participation includes: involvement in national and regional weights and measures conferences; development of industry positions on items brought to the conferences through the standing committees; and constructive support of the conference, its leaders and programs. It also involves a willingness to support the Conference by accepting assignments (whenever possible) made by the Conference Chair.

This support can be technical, such as been provided by industry associations over the years on such subjects as the H-44 New Scale Code, audit trails, the NTEP Weighing and Measuring Sector Committees, the U.S./Canada Mutual Recognition Program, OIML national and international working group programs and meetings. The support can also be programmatic such as the Blue Sky and Privatization Task Forces, development of the NCWM Legal Metrology Control System, the many aspects of creating and bringing the NTEP program to reality, and direct representations to NIST and Congress in support of resources for the Office of Weights and Measures.

In addition, industry provides support to the NCWM through the Associate Member Committee. This support has been a vehicle for the public and private sector members to work together toward a common cause. The Committee has adopted a forward-looking view with regard to the financial needs of the Conference by supporting a realistic meeting registration fee structure. Industry-sponsored social events at National Conference meetings have played an important role in bringing the regulators and the regulated together in a very pleasant atmosphere. This has contributed to the mutual respect that is evident at the conference and during its proceedings.

Industry has an excellent opportunity and an important role to play in the professional/technical training of inspectors and service personnel. Industry, in a very real sense, shares a responsibility with the jurisdictions for promoting and conducting training of officials and service persons. A good example of this is the Institute for Weights and Measures which has, through its education programs, trained hundreds of officials and service persons. An example on a much smaller scale occurred during the process of developing the laboratory test procedures for the U.S./Canada Mutual Recognition program. Industry engineers and NTEP laboratory metrologists had a unique opportunity to exchange technical procedures to the mutual benefit of industry and government.

Perhaps the most critical technical problem before the Conference is training a very broad base of industry technicians and officials with respect to NTEP requirements. The success of a conformance program such as NTEP must ultimately depend on field enforcement to insure equipment standards are met. Quality assurance programs aside, the ultimate test of equipment performance and quality rests jointly in the hands of the service agencies and the field enforcement system. Industry must exert its best efforts and offices in helping the NCWM in marshalling the resources needed to make the integrity of the NTEP process a reality.

Industry also has an important role to play in influencing and heading off efforts to privatize weights and measures regulatory activities, e.g., the transfer of approval, rejection and condemnation authority to the private sector. Recent history has shown the effectiveness

of industry involvement in the privatization debate; this participation must be timely and to the point to insure that the industry view is fully considered.

The NCWM Legal Metrology Control Plan (MCP) recognizes the principle of private sector testing of devices. Registration of Service persons and Agencies Regulation model regulation (Voluntary Registration Regulation, VRR) (NIST Handbook 130, 1994, Uniform Laws and Regulations) authorizes private sector maintenance personnel and service agencies to "remove an official rejection tag or mark placed on a weighing or measuring device by the authority of the director; place in service, until such time an official examination can be made, a weighing or measuring device that has been officially rejected; and place in service, until an official examination can be made, a new or used weighing or measuring device." This, in effect, authorizes a properly registered agency or person to act as an agent with limited powers for a weights and measures jurisdiction.

Kansas, in its approach to "privatization", has created a hybrid system combining the MCP private sector testing of devices concept with a registered service agency/person approach. In Kansas, the user of a device is required to have his equipment tested annually by a registered agency/person; the state inspectors audit this work on a sample basis to insure that, statewide, the test work conducted by the private sector meets state (H-44) standards. Under the Kansas model, private sector agents do not have the authority to reject devices, thus avoiding or minimizing potential conflicts of interest which would arise if the private sector was empowered to reject/condemn equipment.

Under any of the above concepts, there is reason for concern regarding the integrity of "official" tests performed by private sector agents. Some tools used (not an all inclusive list by any means) to insure the quality and uniformity of private sector tests are as follows:

- a. Agents must have available sufficient standards and equipment to adequately test devices as set forth in the Notes section of each applicable code in NIST Handbook 44 (VRR, Section 5);
  - b. A standardized test report form should be used and the private sector agents must be trained in its use. Both the VRR and Kansas assign this training responsibility to the W&M jurisdiction. In that service agencies/persons can and do operate in more than one jurisdiction (inter and intrastate) there is an identifiable urgent need for both standardized forms and for uniform training materials.
  - c. An auditing system to insure that standards are being met by the private sector. In VRR jurisdictions that require a "placed-in-service" report when an officially rejected device is returned to service, good practice suggests that for each placed in service report there should be a subsequent official test when the device is sealed or again rejected. Substandard work would be revealed if a pattern of agent placed-in-service reports was followed by a pattern of official rejection of the devices. In Kansas, quality is addressed by testing a sample of approved devices. However, this approach may be limited by available official resources to audit the private sector testing. The jurisdiction that follows up each placed-in-service report with an official test would have a much better idea about how an individual agency/person was meeting his registration responsibilities.
  - d. A program to test/certify test equipment used by the private sector to place equipment into service. In most states, this program is managed by the state metrologist.
3. The question of what makes up a strong registration program is answered in general terms in the VRR.
- a. However, when one reviews the H-130 summary of VRR adoption, there appears to be some diversity with respect to what has been adopted by the states. Three states are shown as adopting and updating the VRR on an annual basis; 29 states have a registration program based on the VRR, but from an earlier year (not a serious impediment in this case to uniformity); nine states have a program in force but not based on the VRR; 12 states have no law or regulation.
  - b. Regardless of the approach taken, any conceivable variation of a registration program must depend on good data regarding the work of the service agency/person. The test report would appear to be the preferred input document. This applies to devices placed in service as well as repairs. In addition, these reports appear to be essential for the jurisdiction to maintain its device population list. Furthermore, test reports when a device is initially placed in service (assuming the test is uniformly conducted using standardized procedures) become an important source of data with respect to NTEP requirements on production devices meeting type. There is no way that a manual system for keeping track of this information could be cost effective; thus some means by which these reports could enter the W&M information highway must be developed. Conceivably, this process could be automated down to the field inspector level.

- c. In that revocation/suspension of licenses has a very serious impact on the ability of an agency/person to pursue its livelihood, such procedures must be able to pass a very high administrative standard. In order for the regulatory system to meet legal muster, a jurisdiction needs to be in a position to show that it has met its responsibilities by way of training and administration, i.e., adoption of NCWM model laws and regulations (VRR, NTEP, etc.). The private sector generated test report (coupled with official follow-up tests) becomes a key document in determining whether a registration should be revoked or suspended. When revocation/suspension is imposed, consideration should be given to developing a means by which this information can be communicated to other jurisdictions for their attention. This is another need for a much better W&M data system than exists today.

#### RECOMMENDATIONS:

1. That the NCWM request an OWM analysis of industry group/company participation in NCWM activities for some period, i.e., 5 or 10 years. This analysis should be broken down by those groups/companies who appear to have an ongoing interest and to those who appear to be single-issue oriented. Following this analysis, a member of the NCWM leadership should be assigned to meet with the leadership of each group/company and solicit their ideas as to how, in their view, the Conference can be made more effective in addressing marketplace issues. Establish their interest in participating in selected activities of the Conference, i.e., willing to provide testimony at legislative hearings, Associate Member Committee activities. Then follow up with a meaningful assignment. Let's make sure we are listening to our private sector constituents and are aware of their agendas.
2. That the NCWM make an appropriate standing committee assignment to lead the effort to develop standardized test report forms and to prepare EPOs to support the use of these forms. It is suggested that the committee given this assignment draw from the expertise of W&M jurisdictions, weighing and measurement industry associations, the Institute of Weights and Measures and the service agency/dealer interest groups in the ISWM. Also, that a model audit methodology be adopted to help jurisdictions in monitoring VRR performance quality.
3. That the NCWM establish a program to encourage W&M jurisdictions who have not done so to adopt the VRR. The priority for this effort should be directed to states (12) who have no law or regulation. Second priority to those States that have a program in force but not based on the VRR (9). Concurrently, develop an administrative procedures guide for all jurisdictions with VRR.
4. Set up an ad hoc working group to advise the standing committee tasked with VRR with respect to such matters as fees, penalties, administrative procedures for withdrawal of registrations. This group should include service industry representation.
5. In addressing the above recommendations, it must be borne in mind that, on a national scale, the issues relating to private sector service activities cannot be isolated from the effects of non-uniformity in the public sector administration of weights and measures. Private sector service agencies are often subject to the authority of more than one weights and measures jurisdiction. Some agencies conduct their business regionally; others do so nationally. Therefore, any effort to bring uniformity to the private service sector carries with it the obligation that the public sector actively develop a parallel effort to bring uniformity to regulatory and administrative activities. It is strongly recommended that this effort be pursued concurrently with the service agency uniformity agenda.

## Industry's Role

by Richard Tucker, Tokheim Corporation

Industry must support weights and measures on both the State and regional as well as the national levels. The type of support is solely dependent on the level we are working on. At the State and regional level we provide technical support on our equipment. This can and would include supplying technical information (brochures), phone support, and training. Since the contact person is the field inspector, the information must be geared to allow them to recognize standard features and options within the realm of requirements of weights and measures. In simple terms, does the item being inspected meet Handbook 44 and as designed by the manufacturer? We provide information to our distributors relative to weights and measures requirements. We encourage a good working relationship between the service organizations and the local inspectors.

On the national level our support is similar but different. Manufacturing must join and participate in the activities of the national and regional conferences. We still provide technical support but it is geared to the drafting of new requirements and maintaining existing ones. We must provide information to national committee members to what current technology can and cannot provide relative to weights and measures concerns. Our participation provides weights and measures an insight to the direction of the industry and industry gets feedback to weights and measures problems. Our participation creates the network for communications.

A strong registration program for service companies must include registration, training, and follow-up. Registration and training is the commitment by the service organization to perform within a set of guidelines. The training is necessary to establish the testing procedures and set the boundaries. The follow-up would be a function of weights and measures to audit the testing process. If any one of the elements is missing, it becomes a revenue-generating program rather than enhancing the overall program.

Notification of device installation and repairs are the boundaries established during the training. To track compliance to weights and measures standards, a State needs to maintain a database of all devices. To do that you need a Placed-in-Service Report. Part of our startup procedures is to file a warranty registration card. This card starts the warranty period. You need the capability of querying the data to develop notifications for retest. Once the data base is established you can enter as much or as little information that you want. Service information could be part of the database.

A strong penalty section in your law for suspension and/or revocation of registration licenses would be nice but not necessary. If service companies are registered, you always have to option to pull the registration. Please remember that this is a form of income for the service organizations.



## Report of the Privatization Work Group Meeting, November 4-6, 1993, Seattle, WA

Allan M. Nelson, Chairman

### *Summary*

The NCWM Privatization Work Group met in Seattle in order to discuss the conclusions reached by a Washington State (WA) Task Force on Weights and Measures with public and private sector members of that Task Force. The WA Task Force report clearly indicated the overall benefit of weights and measures activities in Washington. Certain findings of the study, however, did not coincide with NCWM Work Group members' experience and expectations. It was imperative that these findings be examined with the WA Task Force, since their implications may have far reaching effects on weights and measures programs in other States. The NCWM Work Group consulted with WA Task Force members to further refine the economic generalizations made in Washington, and to explore what needed to be collected in the future by any weights and measures jurisdiction to help in establishing program priorities and measuring the effectiveness of inspection activities.

**Frequency of Inspection and Compliance Levels Are Correlated.** -- The WA Task Force study concluded that there was no correlation between frequency of inspection and compliance. Chip Kloos, NCWM Work Group member, analyzed the WA data to show that the correlation, not obvious at first glance, exists. His report is appended to this as Appendix A.

**Economic Benefit of Weights and Measures Programs Should Be Shown on a Per Business Basis.** -- The WA Task Force study indicated that the per-capita benefit of the Washington Weights and Measures program far outweighs the per-capita cost. However, the NCWM Work Group pointed out that the benefit and cost per business is much more substantial than per citizen. It is a much better measure of the need for weights and measures enforcement to preserve a fair marketplace for honest businesses to compete. The cost per citizen (in allocated tax dollars) for a weights and measures program is trivial (from 25 to 50 cents per person per year); and, the savings to individual citizens in reduced errors in transactions by the existence of a weights and measures program may be several times the cost, yet the overall savings per individual citizen may amount to only several dollars per year. The savings per household attributable to a weights and measures program may be several hundred dollars per year. However, the cost to any business, even a small business, of error beyond the allowed variations, is substantial (many thousands of dollars per year). Although weights and measures agencies rightly perceive themselves as objective third parties between the buyer and seller, business can be an important ally if the regulatory agency can show business the potential for substantial economic harm to it if inequity is tolerated in the marketplace.

**All jurisdictions should be collecting quantitative data on device errors outside tolerances at the time of test including the "as found" error, rather than only recording whether the device was "in" or "out" of tolerance.** -- Although there is a general correlation between frequency of inspection and compliance level, quantitative data on actual error of a device or trade practice "as found" would provide estimates of the monetary benefit of weights and measures programs, because quantitative error can be converted into dollars. All jurisdictions should be recording not just whether a device is in or out of tolerance, but by how much.

In addition, it is important to record how far from zero any device is found. Most jurisdictions "sanitize" their data, by routinely allowing the device users to adjust their devices when found out of zero and not recording that the device was found off zero. The Work Group is not suggesting that jurisdictions change the practice of allowing users to adjust their devices, but that inspectors should record how far from zero the device is found before adjustment. It is logical to assume that the device likely would remain out of zero until the inspector pointed the problem out to the device user. Record the amount out of zero; this is potential economic gain or loss to the business and its customers if weights and measures inspection did not occur.

Additional information must also be gathered concerning what commodity or service is measured across the device in question (or of a small sample of devices within a jurisdiction,) and the number of times the device is used per day, week, month, or year. Alternatively, annual economic data from Supermarket News, motor fuel sales, agricultural sales, and road construction data from the local tax bureau, agricultural statistics division, and retail marketing associations can be collected so that weights and measures administrators can estimate what shortages or overages on any class of devices are worth to either buyers or sellers over time.

### *Background*

When government must reduce costs, privatization of weights and measures has seemed a reasonable cost-saving measure, since many businesses, and even legislatures, see weights and measures as a "device testing service." The NCWM Privatization Work Group has found that most decision makers considering eliminating weights and measures agencies do not know of (1) the law enforcement



responsibilities of weights and measures; (2) the cost/benefit of weights and measures programs to their business communities; nor (3) any significant improvements in operations or management that can reduce costs in regulatory efforts and increase benefits.

The Work Group identified several questions and set several objectives at its last two meetings:

1. What are the reasons for and benefits of a weights and measures program?
  - The scope and rationale of a weights and measures program was documented in the 1993 Work Group report in order to be a resource and tool for weights and measures administrators to explain what they do and why.
  - The Work Group is now suggesting additional information collection that will assist administrators and legislators quantify the need for a weights and measures program. This will entail not just cost/benefit measurements and estimates, but logical arguments and everyday examples of benefits. For example, Dave Smith noted that weights and measures inspectors do not look only at the performance of a device in a gasoline service station; they examine price signage and other trade practices there. Weights and measures needs to explain the additional duties inspectors perform beyond device inspection.
2. How can a jurisdiction do more with less resources? There are several responses to this issue; the Work Group has not yet explored and listed all alternatives.
  - One major productivity enhancement is through additional job related training; however, State and local budgets, staff, and equipment have been so drastically reduced that they cannot continue routine annual inspections. Administrators should be reminded that productivity increases of 15-20 percent are normally reported as direct benefits of training -- therefore, weights and measures administrators can alleviate staff cutbacks by thoroughly training those who are left.
  - An additional productivity enhancement for weights and measures programs is through adopting and administering a device repair agency registration and training program.
  - Finally, there are opportunities to partner with local consumer groups and business associations. Ask for volunteers from the business and concerned consumer communities to assist the weights and measures jurisdiction in actual inspections, purchases, and alerting the enforcement agency to perceived inequities. Volunteers can be used in answering the telephones, and can be trained to speak about weights and measures to citizen groups.
3. How can a jurisdiction evaluate the effect of shifting certain traditional weights and measures responsibilities to the private sector?
  - For those jurisdictions that have already shifted a significant amount of testing to the private sector or must do so, how do they evaluate their job of auditing this "privatized" system? No study of "privatized" structures such as those operated by Kansas or New Hampshire and more traditional structures has been conducted.
  - How can a jurisdiction evaluate the impact of reduced inspections on the government's part? No independent audit of the status of compliance, equity, etc. has been done to compare a particular type of regulatory structure with another, except for the marketplace surveys conducted in California in which certain counties operate a "variable frequency of inspection" program and others do not.
  - Another question needing answer is how much government resources must be devoted auditing? It is the opinion of the NCWM Work Group that the quality of private service agencies' performance is in direct relationship to what is demanded from them by the State. The State will need the expertise and experience of its measurement specialists (and the same equipment it presently has invested) to audit service work knowledgeably. States cannot simply review the paperwork of service agencies to determine whether they are performing adequately and in more than a superficial manner.
4. How much sampling of the total population of devices can be effective in lieu of testing every device annually? Chip Kloos has offered to design a simple sampling procedure to assist jurisdictions that would like to sample the population of devices in their jurisdiction. It will require comparison against present testing schemes in order to evaluate its effectiveness (see the need to quantify data collected below).

### **Definition and Rationale for Weights and Measures Regulation and Defense of Programs**

The NCWM Privatization Work Group has addressed several issues so far. (1) Members have met with and written State and local agencies, legislatures, and other managers to explain the need for retaining weights and measures enforcement oversight as a government responsibility in order to keep competitive forces from overwhelming honest businesses. (2) The Work Group developed a set of overhead transparencies and slides available to anyone to explain either their own program and why it is needed, or of what a complete program should consist.

On November 4, a presentation on the scope of weights and measures was provided to the members of the WA Task Force based on prior work of the NCWM Work Group (see the Work Group report in the 1993 Annual Meeting Report) in order to emphasize to the private sector representatives that weights and measures regulatory activities were not "device testing services," and to focus discussions on the cost and benefit for government to oversee a private testing force as compared with the cost of more traditionally operated weights and measures programs. Copies of the transparencies used in this presentation are included in Appendix B.

### **Fee Based Programs Provide Little Flexibility**

A basic weights and measures program includes a State weights and measures laboratory, device inspection program, commodity inspection program, and consumer complaint handling. Weights and measures is law enforcement activity, not a device testing service. Fees, however, often mean the difference between minimal oversight and none at all. Fee-based programs are usually based on device testing, whether or not actually levied when a test is performed; thus, fee-based programs rarely allow innovations in device inspection frequency to be applied. Unfortunately, adding the fee question muddies good decision making policy. If a State decides to authorize private companies to test devices, and then the State verifies the work of the private companies, there is not a distributed base of customers upon whom to levy a fee. If a program is to be based on device fees, the fee payer demands something for the fee (e.g. device testing and approval).

### **Weights and Measures Administrators Must Sell Weights and Measures**

Participants at this meeting agreed that better communications with industry needed to be established. Businesses need enlightenment concerning the costs to them in integrity and competition if the marketplace does not demand equity between buyer and seller. Informed businesses can then assist weights and measures agencies communicate with their legislators to maintain a program needed by business as much as by individual consumers.

An error rate that is low may only indicate that a program is working, not that resources are being expended in the wrong areas. Every government-operated program, however, competes with other programs for a portion of tax revenue. Weights and measures administrators must show more than a good return on the public investment in comparison with the relative value of other programs.

### **Variable Frequency of Inspection as an Alternative to Annual Device Testing**

Improving service and law enforcement delivery requires creativity and teamwork. Recognizing economic realities, the NCWM Work Group has outlined what is an effective program, but also realizes that government sometime lacks the resources to deliver a complete program. One of the approaches that Washington State and Iowa Weights and Measures have been directed to study is a "variable frequency of inspection" program.

Darrell Guensler, California Director of Measurement Standards, provided a brief summary of the status of these types of programs in his State:

County governments in California enforce device and commodity laws and regulations. In the 1970's, in order to reapportion resources expended mainly in device testing more towards commodity testing, Ventura County piloted a program that is now in use in about half of the 58 California counties. Based on prior good performance, businesses are placed on extended frequency of inspection cycles. If a business does not pass one of the last two inspections, it remains on normal frequency of inspection cycle (usually annual), and if a business fails its last two inspections, it will be tested on an increased frequency. Combined with this "variable frequency of inspection" is a strong enforcement operation. Since inspection is less frequent, violations must be dealt with in a firm manner. Tools such as written warnings, followed by hearings, followed by prosecutions are linked with less frequent inspections. Less than annual inspection is routine for electric watt-hour and gas vapor meters based on prior studies that indicate that these devices need only be checked on cycles as long as 10 years. All variable frequency programs start with a complete evaluation of all the devices in a jurisdiction. The results of this evaluation are translated into percentage compliance figures which can then be tracked over time, to indicate that the compliance level is maintained, improves, or falls with a given level of inspection.

When variable frequency of inspection programs began in California, weights and measures programs were tax-supported programs. Now fee-based programs have proliferated. Fee-based programs generally impair variable inspection frequency programs as they often require fixed inspection frequencies.

The State of California has performed marketplace surveys on selected commodities, and selected devices. This state-wide level of compliance is a benchmark against which individual local programs can compare. It assists local administrators to identify where the problems are, and to "hoe where the weeds are" according to individual stores, types of businesses, and entire counties.

In the last 10 to 13 years, although California population has risen at a rate greater than the national average, weights and measures at the county level has shrunk 1 to 2 percent per year. Thus, California weights and measures as a whole is 25 percent behind where it was 10 years ago. The question of where to concentrate its resources must constantly be asked.

Whether variable frequency of inspection can be adopted in a particular jurisdiction depends upon the laws and regulations in place, the extent of weights and measures authority within the agency, the enforcement tools available to the agency, its business density, and the level of interaction and type of relationship maintained with the business and individual citizen level. Sufficient data must be available to assess the benefits of any given level of inspection and the risks of reduced oversight.

One of the necessary but sometimes more difficult parts of weights and measures enforcement programs is the evaluation of the integrity of an entire transaction, not just the device used in the transaction. For instance, to buy or sell scrap metal or verify household moving weights requires ingenuity and creativity in finding willing partners to assist in transaction evaluations.

Hard choices are being made in reducing weights and measures protection in California and all over the Nation. If the affected parties are able to check a measurement for themselves, the decision has been made to reduce oversight in such areas. Service based on time measurement is an example of such an area. On the other hand, consumers are not well equipped to protect themselves on over the counter direct sales and purchases of packaged products. In these areas, efforts have been made to at least maintain traditional levels of oversight. This is not always successful as these types of activities are not amenable to a fee for service; therefore, they must compete for increasingly scarce tax revenue. Background documentation of California's variable frequency of inspection activities and marketplace surveys is included in Appendix C.

#### **Variable Frequency Inspection Programs Don't Work Without Strong Enforcement Powers**

In further discussion, the Work Group generally agreed that variable frequency of inspection reduces contact with the businesses regulated, and requires a change in enforcement philosophy. When weights and measures regulators are in relatively more frequent contact with businesses, they can work with the business to improve measurement accuracy and reduce errors; reduced frequency of inspections requires heavy reliance on the deterrent effect of severe consequences if violations are found.

#### **Registration of Service Companies Is Critical**

A key to more effective use of the private sector requires that the State institute a registration or licensing of service agencies and private repair and installation firms. If these firms do not perform, the State has the power to revoke the license or registration. With a license, a firm can install devices and place them into service after repair or installation. The service agent must notify the State of all tests and are the eyes and ears of the government. On the other hand, it is the belief of the NCWM Work Group that if the State operates a good inspection program, it promotes a good maintenance program, and a good service company program.

#### **Training Is More Important Than Ever Before**

Unfortunately, in these days of reduced funding, weights and measures officials have not received adequate training and updating of test methods and criteria; the training provided by weights and measures administrations to the private sector has been even less than for government officials. Weights and measures administrators have not yet fully embraced the importance of training as a primary need to maintain and improve equity.

#### **Guidance on Reduced Inspection When Possible**

In a station having 30 pumps, should the inspector test all 30 or only 5? This decision is not simply one of sampling. There is a cost associated for the agency to get to a particular location. If the agency tests only 5 pumps, does it place seals on just those 5 or on all 30 pumps? Kristie Anderson, representing a local weights and measures jurisdiction, stated that local officials might not have the resources to test all 30 pumps, and in many years, certain stations have never had one of their pumps rejected. How should a local agent remain visible, but cut down the time in any single location? Chip Kloos volunteered to provide her and the Work Group a two-stage sampling procedure, that would look at a small sample at first, and if errors are found, expand the number of devices tested in



## Executive Committee

a single location. Chip will assist local jurisdictions to put their efforts where there is the greatest variability, that is station to station, not pump to pump. Whatever advice is provided must be used judiciously, however, since the travel, set-up, and tear down time can be a significant part of an inspection, not the actual time devoted per pump once these factors are subtracted. For example, both North Carolina and Illinois have approximately the same number of retail motor fuel stations within wide geographic areas, whereas a city jurisdiction has less travel to factor into its testing time.

### **The Washington State Task Force and Its Conclusions**

In 1992, the State of Washington's legislature funded a 1-year study to determine whether their State's weights and measures activities had substantial benefits as compared with the costs. Tom Geiler and Darrell Gonsler of the NCWM Work Group met with the Washington survey team in early 1993, and several members of the Work Group corresponded with the team throughout the State project. The results of the project indicated that the benefits as measured were many times the costs. The Task Force appointed by the legislature is now an advisory body tasked to explore how to fund some kind of weights and measures enforcement program. The question remaining from the Washington study was not whether to retain the program, but how to pay for it. The NCWM Work Group believed that there was a need to interact directly with another State that had considered privatization of weights and measures seriously, and to delve into the data upon which the study had been written. Many members of the WA Task Force were able to meet with the NCWM Work Group at its November meeting, but few State or local weights and measures regulatory officials participated.

Mr. Kent Sherburne, Washington Office of Financial Management, head of the Washington Task Force, provided a presentation on the WA Task Force findings on November 5. His abbreviated report is Appendix D. A copy of the full report can be obtained either from the Office of Weights and Measures or from Mr. Bob Arrington, Washington State Weights and Measures. He said that Washington's findings were that a predominant amount of the error found by annual inspection was random error; this type of error is hard to argue as economic damage to any individual. On this point, Bob Bruce pointed out that lack of maintenance was a common fallout from decreased inspection frequency, one could label this error random rather than fraud, yet "random" does not mean that the error averages out to cost neither the buyer nor the seller in the example of poor maintenance.

Mr. Sherburne argued that accuracy isn't the purpose of weights and measures, economic fairness is the purpose. Therefore, it is necessary to ask probing questions to avoid tunnel vision, to avoid "the device is there, therefore it should be checked."

### **Lack of Quantitative Data**

Mr. Sherburne also lamented that surveys sent out by his office to other jurisdictions did not provide the assistance he needed, no other programs had the quantitative information needed to support the amount of resources expended for weights and measures enforcement. Work Group members questioned his analysis of the cost and benefit of weights and measures on a per capita basis. Although the savings per person for some parts of the program amounted to \$9.50, the savings per agricultural business, for example, in large capacity vehicle scales was approximately \$17,000 apiece. Tom Geiler summarized that weights and measures has no baseline data concerning the error rate as compared with the cost to the local economy without a weights and measures program.

### **Citizen Complaints and Allocation of Tax Revenues**

Policy questions at legislatures focus on reconciling economic shortfalls with response to business and consumer complaints. Businesses have a responsibility to fix the problems, consumers have a responsibility to use information available to them to make informed purchasing decisions. Government has the responsibility of "steering rather than rowing," and using both the carrot and stick to obtain compliance with the law. On one hand, weights and measures is in a unique position to measure its performance, no estimates of the value of a life or safety of an individual need be made. All costs and benefits are directly translatable into dollar values. On the other hand, no harm of an economic nature alone can be compared to the priority placed on the value of life or health.

States note that their largest complaint is in the area of gasoline sales. Dave Smith surmised that this might have some psychological rationale; one can't see gasoline going into one's tank, and if one doesn't like the product, one can't put it back in the retailer's tank.

More data is needed to support weights and measures and businesses contentions that overall the use of scanners has improved the pricing accuracy in retail stores. Scanners in grocery stores are a large percentage of complaints, yet people only report when they are overcharged. One must look at a variety of complaint indicators, however. In the area of scanners, for example, it has been contended that consumers can protect themselves, since they can see errors in pricing. However, potential purchasers must mark down the price displayed on shelves when individual packages are not price marked, in order to compare these prices with those charged at the checkout, this is a procedure few purchasers will follow.

It would seem to be effective to join forces with honest businesses, help them improve the overall management of their pricing systems, and report the improved statistics of compliance and overall errors to the public.

#### Data Collection, Review, and Assessment

Measuring cost/benefit is impossible without uniform standards concerning (1) what constitutes compliance; (2) what the actual measurement errors are; and, (3) what action is taken when errors beyond the standards are found. Although State and local weights and measures have all adopted Handbook 44, for example, as the standards for commercial measuring devices, the actual enforcement of these standards are set at varying levels; for example, rejection of devices often does not occur until the device is out of tolerance by two or three times the tolerance in Handbook 44. Since jurisdictions often do not record the amount by which many classes of devices are in error, there is no information to determine whether changes in policy or procedure improves the overall compliance rate or error rate within a jurisdiction over time. Finally, if devices are adjusted, but that adjustment is not recorded at the time of official testing, the benefit of weights and measures presence is unknown.

Neither the effectiveness of a program itself, nor the effectiveness of changes to a program can be tracked, estimated, or measured if the same standards are not used to evaluate the effects over time or in different locations. This was part of the problem encountered by the WA Task Force when they found widely varying compliance rates in different jurisdictions irrespective of the frequency of inspection. Chip Kloos has shown that a correlation does exist between frequency of inspection and compliance rate. However, if a single jurisdiction is to measure the effectiveness of its program, or to measure the effect of improvements, basic information must be collected to assess programmatic effects. Therefore, the Work Group would like to clarify what data would be useful to collect without too much effort, that can be used to measure programmatic effectiveness. All jurisdictions should be collecting the error of the device as found at the time of test, rather than only recording whether the device was "in" or "out" of tolerance.

#### What needs to be recorded: error "as found"

Small capacity scales:

(1) How far from zero is scale?

If inspectors weren't here, the scale would stay off zero by this amount.

Coach the owner through resetting zero if necessary and continue test, but record amount off zero.

(2) On 30 lb scale, what is error at 1 and 5 lb load?

This is the range of most common use.

(3) Other as found errors not related to measurement: wrong PLU, wrong tare, etc.

(4) What is weighed on the scale (the type of commodity or commodities) and the total number of similar devices in the store or department.

Example of how to use this information:

A delicatessen scale in a supermarket is overregistering 0.01 lb as found (it is off zero), and when 1 and 5 lb test weights are placed on the device, the scale reads 1.01 lb and 5.01 lb. We will assume all the weighings done on this scale have been in error by 0.01 lb since the last inspection by weights and measures one year ago. At average prices of \$8.00 per pound (to be determined in the particular jurisdiction from supermarket sales information from the local retail grocers association), each weighing on the scale is in error 0.01 lb or \$0.08 per transaction from the scale off zero and not adjusted. In this example, we do not know if every weighing operator properly deducted the tare. Supermarket News reports the average sales volume in the delicatessen departments of supermarket to be about \$160,000 per year. With the average amount purchased per delicatessen weighing about 0.5 lb or \$4.00 per purchase, this amounts to about 40,000 weighings per year in an average delicatessen. The particular supermarket is of "average" size and has two scales. If both scales are used about the same amount, we will assume each scale weighs items 20,000 times in the year. If one scale is off by 0.01 lb or \$0.08 per transaction, this amounts to an error of  $\$0.08 \times 20,000$  or \$1,600 per year just from being off zero by 0.01 lb!

Large capacity scales:

(1) How far from zero is scale? Teach inspector how to use error weights.

(2) Perform routine test, record all errors, and circle largest error found during any part of test and amount of test weights at that part of test.

(3) Record capacity of scale.

Retail motor fuel dispensers:

(1) totalizer reading; which pumps are used most in a station?

(2) actual error at 5 gal (-2 cu in, for example), not just "in" or "out" of tolerance.



## Executive Committee

What additional information has to be collected:

- (1) supermarket and retail motor fuel trade volumes, average prices, etc.
- (2) average prices for agricultural, road construction, and other commodities per pound

When weights and measures officials find short weight packages, many jurisdictions compute the economic loss in dollars using the shortage found, and apply that shortage to the amount of that product sold by a given retailer over some period of time. For example, if a shortage of 0.02 lb is found for chicken breasts selling at \$5.00 per pound, the shortage per package is \$0.10. However, if the retailer sells 200 packages of chicken breasts per day, the economic shortage is \$20 per day, \$140 per week, \$560 per month, and \$6,720 per year for that one kind of package in that one store. This analysis is commonly done when determining whether to impose a fine, or take other legal action.

The same economic gain or loss can be estimated for direct sales using scales or meters. For example, if an individual truck scale is under-registering by 80 lb at approximately truck capacity, some estimate of the economic effect of that under weighing can be made. If the truck scale weighing the full truck is different than the scale used to determine the tare, or if the tare weight is a stored-tare value that was determined at some other time, the under-registration does not even partially cancel out. If, in this example, the trucks are being gross weighed only on that scale in order to sell produce, from the farm to a processor, and the commodity is worth \$0.40 per pound, the potential for economic loss to the farmer is  $80 \text{ lb} \times \$0.40 = \$32$  per truck load. During a harvest season of 12 weeks duration, with an average of 100 trucks per day weighed on that scale, farmers are shorted \$3,200 per day, or \$16,000 per 5-day week, or \$192,000 for the 12-week harvest season.

### Standardization of Reporting

NCWM Work Group public sector members were asked to contribute copies of their report forms to determine how they might be easily modified to collect the information needed to measure program effectiveness. See Appendix E. Two conclusions can be drawn from this collection of forms: (1) the wide variety of information that is collected from jurisdiction to jurisdiction, and the differing placement of this information on a paper form; and (2) the fact that there are certain forms already containing key information that should be generally collected across all types and classes of devices. For example, the forms provided by private service companies varied greatly from the report forms used by the weights and measures government representative. Illinois report forms for meters and a few for scales generally had locations on the forms to report the "as found" condition in terms of error. Other State forms that we have seen usually have space under "remarks" to add "error as found." Errors at 1, 3, and 5 lb can be circled on small scale test reports. The maximum error under any part of a test of mid and large capacity scales can be circled; the test load must always be identified, of course.

Certainly, none of the forms that the Work Group examined appeared designed for computer data entry either in a central office or in the field. Since sufficient routine inspection data is not available, California has attempted marketplace surveys to determine the level of marketplace equity by sampling stores, devices, and practices to obtain a status of equity within the State at any given point in time. This is an effort that has been conducted above and beyond routine inspections and should be made to efficiently incorporate such evaluations into the routine activities of a weights and measures program. We do not need data of the above sort for all devices in a jurisdiction to evaluate the condition of the marketplace. We do need a stratified sampling process to assist us in evaluation. Laptop computers would greatly assist in data collection at the field level.

The Work Group believes that the weights and measures jurisdictions should take data collection seriously and that a presentation should be made at the Annual Meeting in order to get some of the fine points across in this area. A standardized report form would certainly assist in obtaining the minimum data needed to make economic estimates across jurisdictions.

### Issues that were not addressed in detail by the Work Group:

1. What are the relative costs per device to do 100 percent testing as compared with sampling devices (either public agency or private business)? The cost of equipping inspectors to sample the population of devices would be equal to the cost of equipping them for 100% testing. The amount of labor cost reduction due to reduced number of devices tested within a given area would depend upon the percentage of total time contributed by travel time in an inspection. In rural States, the travel time is often a major fraction of the total inspection time. The additional time to inspect a retailer's business practices over and above testing for the compliance of the device with Handbook 44 should also be included.
2. What is the relative compliance level for 100 percent testing as compared with compliance when testing only a sample of devices? When comparing these alternatives, the type of enforcement actions when noncompliance is found must also be

factored into the comparison. Because of the varying enforcement methodologies in place at the State and local level, a comparison of these types of testing programs will need careful planning and organization.

3. How many jurisdictions target only devices that do not have high levels of compliance? We know that California counties and Wisconsin use variable frequency of inspection. We do not know if cutbacks have occurred in any jurisdiction that have required testing only of devices with low compliance histories.
4. How can jurisdictions fund package testing and investigation of other commercial trade issues when their income is based upon device testing fees? Business licenses have been proposed, but no jurisdiction has been able to implement this type of program.
5. How feasible are minimum training requirements for government agent and for service company employees? How can training requirements be linked to minimum performance standards? Can industry play a more effective role in delivering training or other necessary tools to obtain the most effective weights and measures program possible?

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**Appendix B**  
**National Conference on Weights and Measures**  
**Budget for 1995 (Jan 1 - Dec 31)**  
**Compared with 1993 Actual and 1994 Budget**

**Table 1. Income**

Category Number	Account Description	FY 94 Budget	Proposed FY 95 Budget	FY 93 Actual
<b>General Funds</b>				
411	Registration Fees	\$66,000	\$66,000	\$40,500
412	Membership Fees	\$122,500	\$122,500	\$117,215
414	Interest	\$1,000	\$1,000	\$1,484.33
414	Associate Membership Account	-0-	-0-	-0-
416	Other Income	-0-	-0-	\$3.00
410	Income, General Fund	\$189,500	\$189,500	\$159,202.33
<b>Expense &amp; Income (Reimbursable)</b>				
484	Special Events	\$2,000	\$2,000	\$2,246.81
482	Publications	\$20,000	\$3,500	\$8,108.30
484	NTP, Seminars	\$6,000	-----	-0-
485	Promotional	\$2,000	-0-	-0-
486	Grain Equipment Cooperative Agreement	\$15,000	-----	\$13,624.29
480	Income, E&I	\$45,000	\$5,500	23,979.40
<b>Total Income</b>				
400	Total Income	\$234,500	\$195,000	\$183,181.73



Table 3. Expenses

Category Number	Account Description	FY 94 Budget	Proposed FY 95 Budget	FY 93 Actual
<b>General Funds</b>				
511	Annual Meeting	\$44,000	47,200	\$31,852.88
512	Interim Meeting	\$35,500	31,000	\$26,587.95
513	Travel - Committees	\$24,000	18,500	\$41,816.81
514	Travel-Task Forces/Special Committees	\$17,700	\$16,000	\$37,928.72
515	Chairman/Chair Elect	\$22,000	20,500	\$15,436.25
516	Administration	\$36,500	23,500	\$41,198.42
517	Printing/Publications	\$8,500	\$19,500	\$28,127.46
518	Training & Train-the-Trainer	-0-	_____	788.85
510	Expenses, General Fund	\$188,200	\$176,200	\$223,737.94
<b>Expense &amp; Income (Reimbursable)</b>				
581	Special Events	\$2,000	\$2,000	-0-
582	Publications	\$13,500	\$3,500	\$9,125.80
584	NTP, Seminars	\$6,000	-----	-0-
585	Promotional	\$1,000	-0-	-0-
586	Grain Equipment Cooperative Agreement	\$15,000	-----*	\$7,599.75
580	Expenses, E&I	\$37,500	\$5,500	\$16,725.50
<b>Total Expenses</b>				
500	Total Expenses	\$225,700	\$181,700	\$240,463.44

**Table 5. Associate Membership Account**

Carry-over balance 11/93:	\$8,878.65	Carry over balance 1/1/94:	\$12,748.29
Income:	26,147.11	Income (estimated) for all of 1994:	25,200.00
Total Income:	\$35,025.76	Income (estimated) by 7/1/94:	15,000.00
		Total (estimated) by 7/1/94:	27,748.29
Expenses:		Expenses (estimated)	
Benjamin Ranch	\$15,884.57	San Diego Zoo	15,580.00
Bank Checks	14.25	Balance 7/1/94	\$12,168.29
Consumer Pamphlet	6,378.65	Rest of year (estimate) to 12/31/94	10,200.00
Total Expenses:	\$22,277.47	Balance-end of year (estimated) 12/31/94	22,368.29
Balance 12/31/93	\$12,748.29	Less Training Scholarship	11,000.00
		Balance-end of year (estimated) 12/31/94	\$11,368.29

**Table 6. NTEP Accounts**

Category Number	Account Description	FY 94 Budget	Proposed FY 95 Budget	FY 93 Actual
483.1	NTEP: Logo Sales	\$1,500	\$1,000	\$2,000
483.2	NTEP: Maintenance Fee	\$87,500	\$105,000	\$86,600*
483.3	NTEP: Publications Sales (Publication 5)	\$10,000	\$10,000	\$10,325
483	NTEP Operations	\$99,000	\$116,000	
<p>483: The fall of 1993 was the first time we collected an NTEP maintenance fee. We had estimated 875 CCs would remain active and 1040 were maintained (\$104,000) by the end of January 1994 (*collected in FY 1993). We expect the number of CCs to the issued and maintenance fees to be paid to offset the loss of income from CCs allowed to become inactive next year. Therefore, we estimate 1995 maintenance fees to be \$105,000 (approximately matching income of 94). Logo and Publication 5 are expected to generate another \$11,000 (accounted in 482 in 1993).</p>				
583.1	NTEP Board of Governors	\$7,000	\$7,000	
<p>This account will pay for the event of a hearing on an appeal that might not be conveniently scheduled as part of the Interim or Annual Meeting. It also pays for meetings of the Board on other NTEP issues (1994 Software).</p>				

Table 6. NTEP Accounts

Category Number	Account Description	FY 94 Budget	Proposed FY 95 Budget	FY 93 Actual
583.2	NTETC: Weighing Sector	\$12,000	\$7,000	\$11,183.94
583.3	NTETC: Measuring Sector	\$5,000	\$5,000	
583.4	NTETC: Belt Conveyor Scale Sector	\$3,500	\$3,500	
583.5	Automatic Weighing Systems Work Group	\$6,000	\$10,000	\$3,004.42
583.55	Multiple Dimensions Device Work Group	\$5,000		
<p>The ongoing work of the sectors to develop and maintain type evaluation criteria, checklists, and policy requires from one to two meetings per year.</p> <p>583.2: The Weighing Sector costs were predicted too high for 1994 since it now appears that only one meeting per year will be necessary. Therefore costs for a single meeting have been estimated for 1995 as well.</p> <p>583.4: The Belt Conveyor Scale Sector did not meet in 1993 but is expected to meeting in 1994 and perhaps in 1995.</p> <p>583.5: The Automatic Weighing Systems Work Group reports to the Weighing Sector. When their work is concluded on systems for meat and poultry plants, they have been asked to develop type evaluation criteria for the shipping industry.</p> <p>No Account Number: It is expected that once a code is developed by the Multiple Dimension Devices Work Group (operating in 1994 under 513.3 S&amp;T Committee), there may need to be developed checklists and type evaluation criteria under a new cost center in the NTEP accounts. No decision was made about this group because it was not known how close the group is to a tentative code in H44 and therefore what their needs in type evaluation criteria development might be.</p>				
583.6	U.S./Canada Mutual Recognition Work Group	\$10,000	\$10,000	\$10,864.01
The two countries have been asked to expand in two specific areas: liquid measuring devices and to issue OIML certificates.				
583.7	Participating Laboratory Conference	\$10,000	\$10,000	-0-
It is hoped that the Participating Laboratories can meet as part of the U.S./Canada Mutual Recognition Work Group meetings, and these costs can then be reduced.				
583.8	NTEP Personnel - cashier - clerk	\$22,000	\$20,000	-0-
Since this is the first year for this program, we cannot yet predict what the specific external costs for maintenance of the NTEP Certificates will be.				
583.9	NTEP Publication Pub 5; Pub 14; Logo Printing	\$12,000	\$12,000	\$11,783.10
The expense of printing Publication 5 was accounted in 582.2 in 1993.				
583	NTEP Operations	\$87,500	\$84,500	

## Appendix C. Floor Scales Data

Late in 1993, eight different models of production floor scales, involving seven different manufacturers, were tested in an environmental chamber. An Ohio NTEP laboratory representative assisted in the testing and was present for all of the tests.

The scales were selected and purchased based on the premise that the scales should be legal for trade and traceable to an NTEP CC.

- ▶ All scales were 5000 division scales.
- ▶ All scales utilized 4 load cells.
- ▶ Seven were 5000 x 1 lb, 4 ft x 4 ft.
- ▶ One was 2500 x 0.5 lb, 3 ft x 3ft.
- ▶ Six scales were traceable to an NTEP CC and used load cells traceable to an NTEP CC with appropriate  $V_{min}$  and  $n_{max}$  values.
- ▶ One scale has been assigned to an NTEP lab for field evaluation so is "in process." The load cells used were appropriate NTEP cells.
- ▶ The eighth scale does not appear to be traceable to an NTEP CC, however it had a Class III marking. No markings could be found on the load cells used in this scale.

It should be noted that these 2500- to 5000-pound weighing elements were tested for compliance with influence factor requirements even though NTEP does not normally test weighing elements with a capacity of more than 2000 lb in the laboratory. Two increasing/decreasing load tests and shift tests were conducted at four different temperatures. The order of testing was the performance of an increasing/decreasing load test, then a 1/2 capacity shift test, then another increasing/decreasing load test, and finally a 1/4 capacity shift test. This order was followed for each scale. Each increasing/decreasing load test took approximately 10 minutes.

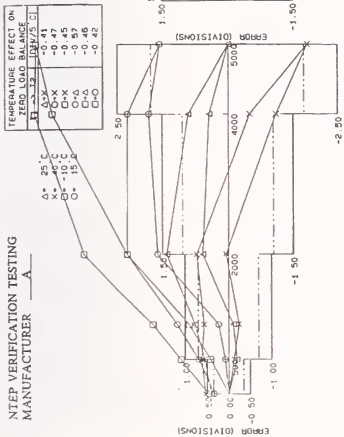
Comments concerning the tests and results of tests of the eight scales: (see data sheets labeled Manufacturer A thru H)

- ▶ only scale H met Handbook 44 acceptance tolerance limits for all tests
- ▶ if we don't consider the first increasing/decreasing load test, since the weighing elements were not exercised prior to testing, then scales H & F pass and scale E is very close even though it uses up the entire tolerance range
- ▶ if we do not consider the - 10 °C tests, five or six of the scales meet requirements

DATE 11-32-1932.

NTP VERIFICATION TESTING  
MANUFACTURER: A

DATE 11-32-1932.

NTP VERIFICATION TESTING  
MANUFACTURER: AAPPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TESTAPPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

DATE 11-32-1932.

NTP VERIFICATION TESTING  
MANUFACTURER: A

DATE 11-32-1932.

NTP VERIFICATION TESTING  
MANUFACTURER: A

LOAD	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0	0	0
3500	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0	0	0
4500	0	0	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	0	0

LOAD	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0	0	0
3500	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0	0	0
4500	0	0	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	0	0

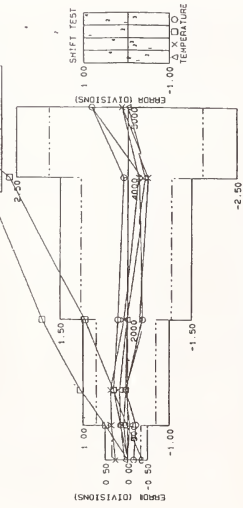


NTEP VERIFICATION TESTING  
MANUFACTURER: B

DATE: LL32-1992.

TEMPERATURE EFFECT ON	
ZERO LOAD BALANCE	
TEMP. (°C)	ΔX (DIVISIONS)
25	0.16
20	-0.18
15	-0.20
10	-0.22
5	-0.10
0	-0.05

Δ = 25°C  
X = 40°C  
O = 15°C  
□ = 0°C

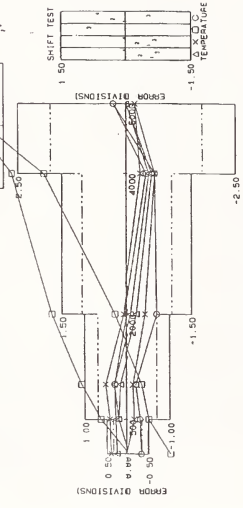


NTEP VERIFICATION TESTING  
MANUFACTURER: B

DATE: LL32-1993.

TEMPERATURE EFFECT ON	
ZERO LOAD BALANCE	
TEMP. (°C)	ΔX (DIVISIONS)
25	0.27
20	-0.27
15	-0.24
10	-0.18
5	-0.16
0	-0.18

Δ = 25°C  
X = 40°C  
O = 15°C  
□ = 0°C



NTEP VERIFICATION TESTING  
MANUFACTURER: B

DATE: LL32-1993.

CAP 5000_LHS DIV. 5000.	
LOAD	OUTPUT AT TEMP (°C)
0	25
500	20
1000	15
1500	10
2000	5
2500	0
3000	-5
3500	-10
4000	-15
4500	-20
5000	-25

LOAD	25	20	15	10	5	0	-5	-10	-15	-20	-25	ERROR (DIVISIONS)
0	0	0	0	0	0	0	0	0	0	0	0	0
500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
1000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
1500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
2000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
2500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
3000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
3500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
4000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
4500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
5000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434

NTEP VERIFICATION TESTING  
MANUFACTURER: B

DATE: LL32-1992.

CAP 5000_LHS DIV. 5000.	
LOAD	OUTPUT AT TEMP (°C)
0	25
500	20
1000	15
1500	10
2000	5
2500	0
3000	-5
3500	-10
4000	-15
4500	-20
5000	-25

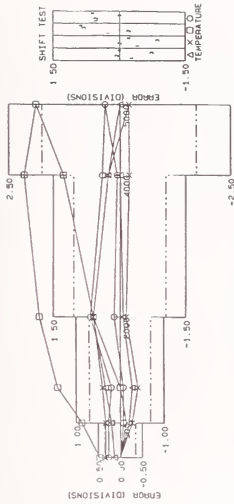
LOAD	25	20	15	10	5	0	-5	-10	-15	-20	-25	ERROR (DIVISIONS)
0	0	0	0	0	0	0	0	0	0	0	0	0
500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
1000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
1500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
2000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
2500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
3000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
3500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
4000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
4500	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434
5000	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434	19434

DATE: 11-24-1993.

TEMPERATURE EFFECT ON ERROR (DIVISIONS)	
TEMP. (°C)	ERROR (DIVISIONS)
11	-0.25
12	-0.25
13	-0.25
14	-0.25
15	-0.25
16	-0.25
17	-0.25
18	-0.25
19	-0.25
20	-0.25
21	-0.25
22	-0.25
23	-0.25
24	-0.25
25	-0.25
26	-0.25
27	-0.25
28	-0.25
29	-0.25
30	-0.25
31	-0.25
32	-0.25
33	-0.25
34	-0.25
35	-0.25
36	-0.25
37	-0.25
38	-0.25
39	-0.25
40	-0.25
41	-0.25
42	-0.25
43	-0.25
44	-0.25
45	-0.25
46	-0.25
47	-0.25
48	-0.25
49	-0.25
50	-0.25
51	-0.25
52	-0.25
53	-0.25
54	-0.25
55	-0.25
56	-0.25
57	-0.25
58	-0.25
59	-0.25
60	-0.25
61	-0.25
62	-0.25
63	-0.25
64	-0.25
65	-0.25
66	-0.25
67	-0.25
68	-0.25
69	-0.25
70	-0.25
71	-0.25
72	-0.25
73	-0.25
74	-0.25
75	-0.25
76	-0.25
77	-0.25
78	-0.25
79	-0.25
80	-0.25
81	-0.25
82	-0.25
83	-0.25
84	-0.25
85	-0.25
86	-0.25
87	-0.25
88	-0.25
89	-0.25
90	-0.25
91	-0.25
92	-0.25
93	-0.25
94	-0.25
95	-0.25
96	-0.25
97	-0.25
98	-0.25
99	-0.25
100	-0.25

Δ = 25°C  
 Δ = 10°C  
 Δ = 15°C  
 Δ = 0.27  
 Δ = 0.07

NTPE VERIFICATION TESTING  
 MANUFACTURER: C



APPLIED LOAD (DIVISIONS)  
 INCREASING/DECREASING - LOAD TEST

DATE: 11-24-1993.

NTPE VERIFICATION TESTING  
 MANUFACTURER: C

CAP 5000 - 1st DIV. 2000	
LOAD (LBS)	Output AT Temp (°C)
0	4480
500	4468
1000	4456
1500	4444
2000	4432
2500	4420
3000	4408
3500	4396
4000	4384
4500	4372
5000	4360
5500	4348
6000	4336
6500	4324
7000	4312
7500	4300
8000	4288
8500	4276
9000	4264
9500	4252
10000	4240
10500	4228
11000	4216
11500	4204
12000	4192
12500	4180
13000	4168
13500	4156
14000	4144
14500	4132
15000	4120
15500	4108
16000	4096
16500	4084
17000	4072
17500	4060
18000	4048
18500	4036
19000	4024
19500	4012
20000	4000
20500	3988
21000	3976
21500	3964
22000	3952
22500	3940
23000	3928
23500	3916
24000	3904
24500	3892
25000	3880
25500	3868
26000	3856
26500	3844
27000	3832
27500	3820
28000	3808
28500	3796
29000	3784
29500	3772
30000	3760
30500	3748
31000	3736
31500	3724
32000	3712
32500	3700
33000	3688
33500	3676
34000	3664
34500	3652
35000	3640
35500	3628
36000	3616
36500	3604
37000	3592
37500	3580
38000	3568
38500	3556
39000	3544
39500	3532
40000	3520
40500	3508
41000	3496
41500	3484
42000	3472
42500	3460
43000	3448
43500	3436
44000	3424
44500	3412
45000	3400
45500	3388
46000	3376
46500	3364
47000	3352
47500	3340
48000	3328
48500	3316
49000	3304
49500	3292
50000	3280
50500	3268
51000	3256
51500	3244
52000	3232
52500	3220
53000	3208
53500	3196
54000	3184
54500	3172
55000	3160
55500	3148
56000	3136
56500	3124
57000	3112
57500	3100
58000	3088
58500	3076
59000	3064
59500	3052
60000	3040
60500	3028
61000	3016
61500	3004
62000	2992
62500	2980
63000	2968
63500	2956
64000	2944
64500	2932
65000	2920
65500	2908
66000	2896
66500	2884
67000	2872
67500	2860
68000	2848
68500	2836
69000	2824
69500	2812
70000	2800
70500	2788
71000	2776
71500	2764
72000	2752
72500	2740
73000	2728
73500	2716
74000	2704
74500	2692
75000	2680
75500	2668
76000	2656
76500	2644
77000	2632
77500	2620
78000	2608
78500	2596
79000	2584
79500	2572
80000	2560
80500	2548
81000	2536
81500	2524
82000	2512
82500	2500
83000	2488
83500	2476
84000	2464
84500	2452
85000	2440
85500	2428
86000	2416
86500	2404
87000	2392
87500	2380
88000	2368
88500	2356
89000	2344
89500	2332
90000	2320
90500	2308
91000	2296
91500	2284
92000	2272
92500	2260
93000	2248
93500	2236
94000	2224
94500	2212
95000	2200
95500	2188
96000	2176
96500	2164
97000	2152
97500	2140
98000	2128
98500	2116
99000	2104
99500	2092
100000	2080

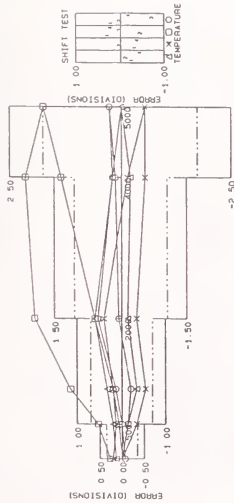
2 4  
1 3

DATE: 11-24-1993.

TEMPERATURE EFFECT ON ERROR (DIVISIONS)	
TEMP. (°C)	ERROR (DIVISIONS)
11	-0.16
12	-0.16
13	-0.16
14	-0.16
15	-0.16
16	-0.16
17	-0.16
18	-0.16
19	-0.16
20	-0.16
21	-0.16
22	-0.16
23	-0.16
24	-0.16
25	-0.16
26	-0.16
27	-0.16
28	-0.16
29	-0.16
30	-0.16
31	-0.16
32	-0.16
33	-0.16
34	-0.16
35	-0.16
36	-0.16
37	-0.16
38	-0.16
39	-0.16
40	-0.16
41	-0.16
42	-0.16
43	-0.16
44	-0.16
45	-0.16
46	-0.16
47	-0.16
48	-0.16
49	-0.16
50	-0.16
51	-0.16
52	-0.16
53	-0.16
54	-0.16
55	-0.16
56	-0.16
57	-0.16
58	-0.16
59	-0.16
60	-0.16
61	-0.16
62	-0.16
63	-0.16
64	-0.16
65	-0.16
66	-0.16
67	-0.16
68	-0.16
69	-0.16
70	-0.16
71	-0.16
72	-0.16
73	-0.16
74	-0.16
75	-0.16
76	-0.16
77	-0.16
78	-0.16
79	-0.16
80	-0.16
81	-0.16
82	-0.16
83	-0.16
84	-0.16
85	-0.16
86	-0.16
87	-0.16
88	-0.16
89	-0.16
90	-0.16
91	-0.16
92	-0.16
93	-0.16
94	-0.16
95	-0.16
96	-0.16
97	-0.16
98	-0.16
99	-0.16
100	-0.16

Δ = 25°C  
 Δ = 10°C  
 Δ = 15°C  
 Δ = 0.27  
 Δ = 0.07

NTPE VERIFICATION TESTING  
 MANUFACTURER: C



APPLIED LOAD (DIVISIONS)  
 INCREASING/DECREASING - LOAD TEST

DATE: 11-24-1993.

NTPE VERIFICATION TESTING  
 MANUFACTURER: C

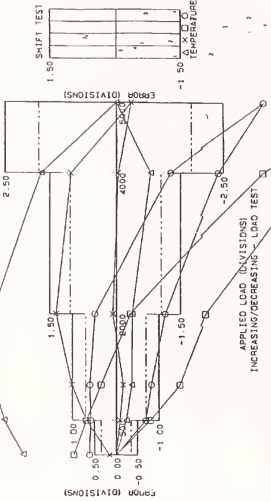
CAP 5000 - 1st DIV. 2000	
LOAD (LBS)	Output AT Temp (°C)
0	4481
500	4474
1000	4466
1500	4458
2000	4450
2500	4442
3000	4434
3500	4426
4000	4418
4500	4410
5000	4402
5500	4394
6000	4386
6500	4378
7000	4370
7500	4362
8000	4354
8500	4346
9000	4338
9500	4330
10000	4322
10500	4314
11000	4306
11500	4298
12000	4290
12500	4282
13000	4274
13500	4266
14000	4258
14500	4250
15000	4242
15500	4234
16000	4226
16500	4218
17000	4210
17500	4202
18000	4194
18500	4186
19000	4178
19500	4170
20000	4162
20500	4154
21000	4146
21500	4138
22000	4130
22500	4122
23000	4114
23500	4106
24000	4098
24500	4090
25000	4082
25500	4074
26000	4066
26500	4058
27000	4050
27500	4042
28000	4034
28500	4026
29000	4018
29500	4010
30000	4002
30500	3994
31000	3986
31500	3978
32000	3970
32500	3962
33000	3954
33500	3946
34000	3938
34500	3930
35000	3922
35500	3914
36000	3906
36500	3898
37000	3890
37500	3882
38000	3874
38500	3866
39000	3858
39500	3850
40000	3842
40500	3834
41000	3826
41500	3818
42000	3810
42500	3802
43000	3794
43500	3786
44000	3778
44500	3770
45000	3762
45500	3754
46000	3746
46500	3738
47000	3730
47500	3722
48000	3714
48500	3706
49000	3698
49500	3690
50000	3682
50500	3674
51000	3666
51500	3658
52000	3650
52500	3642
53000	3634
53500	3626
54000	3618
54500	3610
55000	3602
55500	3594
56000	3586
56500	3578
57000	3570
57500	3562
58000	3554
58500	3546
59000	3538
59500	3530
60000	3522
60500	3514
61000	3506
61500	3498
62000	3490
62500	3482
63000	3474
63500	3466
64000	3458
64500	3450
65000	3442
65500	3434
66000	3426
66500	3418
67000	3410
67500	3402
68000	3394
68500	3386
69000	3378
69500	3370
70000	3362
70500	3354
71000	3346
71500	3338
72000	3330
72500	3322
73000	3314
73500	3306
74000	3298
74500	3290
75000	3282
75500	3274
76000	3266
76500	3258
77000	3250
77500	3242
78000	3234
78500	3226
79000	3218
79500	3210
80000	3202
80500	3194
81000	3186
81500	3178
82000	3170
82500	3162
83000	3154
83500	3146
84000	3138
84500	3130
85000	3122
85500	3114
86000	3106
86500	3098
87000	3090
87500	3082
88000	3074
88500	3066
89000	3058
89500	3050
90000	3042
90500	3034
91000	3026
91500	3018
92000	3010
92500	3002
93000	2994
93500	2986
94000	2978
94500	2970
95000	2962
95500	2954
96000	2946
96500	2938
97000	2930
97500	2922
98000	2914
98500	2906
99000	2898
99500	2890
100000	2882

DATE 11-26-1992

NTEP VERIFICATION TESTING  
MANUFACTURER: D

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
TEMP (°C)	ERROR (DIVISIONS)
25	0.00
40	0.02
15	0.04
0	0.06
-15	0.08
-30	0.10

Δ: 25°C  
X: 40°C  
O: 15°C  
□: 0°C  
Δ: -15°C  
X: -30°C

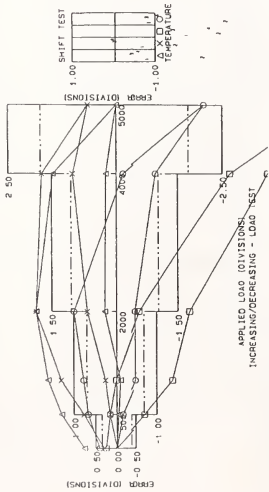


DATE 11-26-1992

NTEP VERIFICATION TESTING  
MANUFACTURER: D

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
TEMP (°C)	ERROR (DIVISIONS)
25	0.00
40	0.01
15	0.02
0	0.03
-15	0.04
-30	0.05

Δ: 25°C  
X: 40°C  
O: 15°C  
□: 0°C  
Δ: -15°C  
X: -30°C



DATE 11-26-1992

NTEP VERIFICATION TESTING  
MANUFACTURER: D

DATE 11-26-1992

NTEP VERIFICATION TESTING  
MANUFACTURER: D

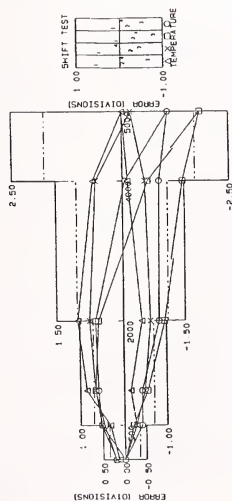
CAP 5000 lbs DIV. 5000	
LOAD	OUTPUT AT TEMP (°C)
TEMP (°C)	ERROR (DIVISIONS)
25	0.00
40	0.01
15	0.02
0	0.03
-15	0.04
-30	0.05

CAP 5000 lbs DIV. 5000	
LOAD	OUTPUT AT TEMP (°C)
TEMP (°C)	ERROR (DIVISIONS)
25	0.00
40	0.01
15	0.02
0	0.03
-15	0.04
-30	0.05

DATE 1-10-1992

TEMPERATURE EFFECT ON

TEMPERATURE EFFECT ON ZERO LOAD BALANCE		01V/5°C
T1 -> T2		
Δ×X		0.30
○×X		0.20
□×X		0.09
○×Δ		-0.03
□×Δ		-0.02
□×○		-0.01

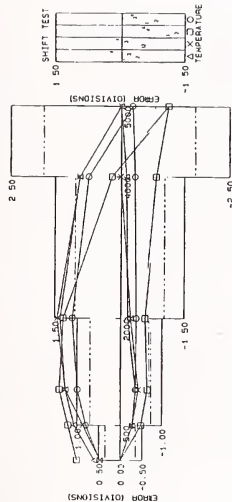


APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD

MANUFACTURER: E

[illegible]

**NTEP VERIFICATION TESTING**  
**MANUFACTURER: E**

$$\begin{array}{r} 25.000 \\ 40.000 \\ -10.000 \\ \hline 55.000 \end{array}$$


APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

MANUFACTURER: E

[illegible]



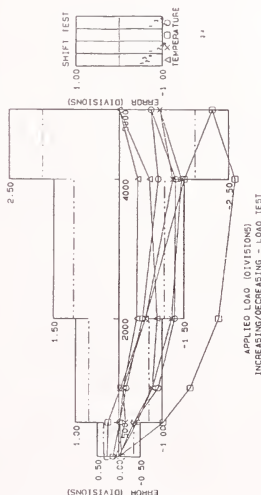


NTFP VERIFICATION TESTING  
MANUFACTURER: G

DATE: 12-02-1993

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
1	2
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

X = 25°C  
Y = 40°C  
Z = 10°C  
A = 15°C  
B = 31°C  
C = 0.20



APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

NTFP VERIFICATION TESTING  
MANUFACTURER: G

DATE: 12-02-1993

LOAD		OUTPUT AT TEMP (°C)		ERROR (DIVISIONS)	
1	2	3	4	5	6
11	12	13	14	15	16
17	18	19	20	21	22
23	24	25	26	27	28
29	30	31	32	33	34
35	36	37	38	39	40
41	42	43	44	45	46
47	48	49	50	51	52
53	54	55	56	57	58
59	60	61	62	63	64
65	66	67	68	69	70
71	72	73	74	75	76
77	78	79	80	81	82
83	84	85	86	87	88
89	90	91	92	93	94
95	96	97	98	99	100

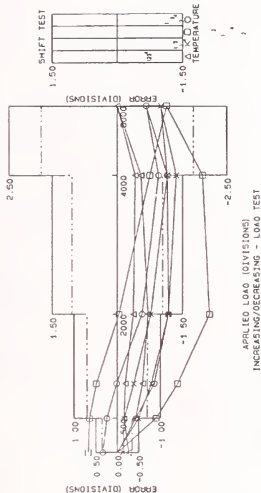
2 4 1 3

NTFP VERIFICATION TESTING  
MANUFACTURER: G

DATE: 12-02-1993

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
1	2
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

X = 25°C  
Y = 40°C  
Z = 10°C  
A = 15°C  
B = 31°C  
C = 0.20



APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

NTFP VERIFICATION TESTING  
MANUFACTURER: G

DATE: 12-02-1993

LOAD		OUTPUT AT TEMP (°C)		ERROR (DIVISIONS)	
1	2	3	4	5	6
11	12	13	14	15	16
17	18	19	20	21	22
23	24	25	26	27	28
29	30	31	32	33	34
35	36	37	38	39	40
41	42	43	44	45	46
47	48	49	50	51	52
53	54	55	56	57	58
59	60	61	62	63	64
65	66	67	68	69	70
71	72	73	74	75	76
77	78	79	80	81	82
83	84	85	86	87	88
89	90	91	92	93	94
95	96	97	98	99	100

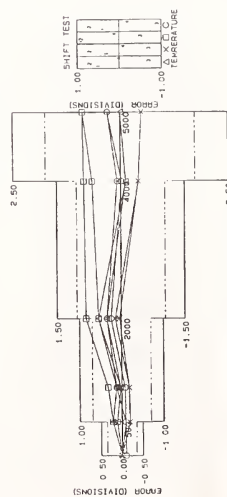
2 4 1 3

DATE 12-02-1992

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
TEMPERATURE	ERROR (DIVISIONS)
11 → 12 (°F/°C)	
Δ+ 25°C	0.50
Δ+ 40°C	0.50
Δ- 10°C	-0.50
Δ- 25°C	-0.50
Δ- 40°C	-0.50
Δ- 10°C	-0.50
Δ- 25°C	-0.50
Δ- 40°C	-0.50

NTEP VERIFICATION TESTING  
MANUFACTURER: H

Δ+ 25°C  
Δ+ 40°C  
Δ- 10°C  
Δ- 25°C  
Δ- 40°C

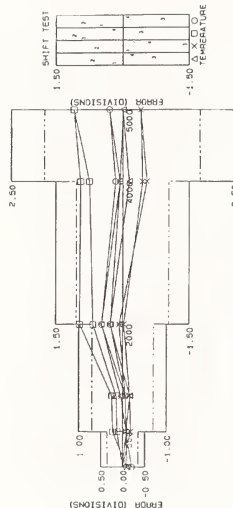
APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

DATE 12-02-1992

TEMPERATURE EFFECT ON ZERO LOAD BALANCE	
TEMPERATURE	ERROR (DIVISIONS)
11 → 12 (°F/°C)	
Δ+ 25°C	0.50
Δ+ 40°C	0.50
Δ- 10°C	-0.50
Δ- 25°C	-0.50
Δ- 40°C	-0.50
Δ- 10°C	-0.50
Δ- 25°C	-0.50
Δ- 40°C	-0.50

NTEP VERIFICATION TESTING  
MANUFACTURER: H

Δ+ 25°C  
Δ+ 40°C  
Δ- 10°C  
Δ- 25°C  
Δ- 40°C

APPLIED LOAD (DIVISIONS)  
INCREASING/DECREASING - LOAD TEST

DATE 12-02-1992

NTEP VERIFICATION TESTING	
MANUFACTURER: <u>H</u>	
CAP 2500 lbs DIV. 2000	
LOAD	OUTPUT AT TEMP (°C)
0	0
500	250
1000	500
1500	750
2000	1000
2500	1250
3000	1500
3500	1750
4000	2000
4500	2250
5000	2500
5500	2750
6000	3000
6500	3250
7000	3500
7500	3750
8000	4000
8500	4250
9000	4500
9500	4750
10000	5000
10500	5250
11000	5500
11500	5750
12000	6000
12500	6250
13000	6500
13500	6750
14000	7000
14500	7250
15000	7500
15500	7750
16000	8000
16500	8250
17000	8500
17500	8750
18000	9000
18500	9250
19000	9500
19500	9750
20000	10000
20500	10250
21000	10500
21500	10750
22000	11000
22500	11250
23000	11500
23500	11750
24000	12000
24500	12250
25000	12500
25500	12750
26000	13000
26500	13250
27000	13500
27500	13750
28000	14000
28500	14250
29000	14500
29500	14750
30000	15000
30500	15250
31000	15500
31500	15750
32000	16000
32500	16250
33000	16500
33500	16750
34000	17000
34500	17250
35000	17500
35500	17750
36000	18000
36500	18250
37000	18500
37500	18750
38000	19000
38500	19250
39000	19500
39500	19750
40000	20000
40500	20250
41000	20500
41500	20750
42000	21000
42500	21250
43000	21500
43500	21750
44000	22000
44500	22250
45000	22500
45500	22750
46000	23000
46500	23250
47000	23500
47500	23750
48000	24000
48500	24250
49000	24500
49500	24750
50000	25000
50500	25250
51000	25500
51500	25750
52000	26000
52500	26250
53000	26500
53500	26750
54000	27000
54500	27250
55000	27500
55500	27750
56000	28000
56500	28250
57000	28500
57500	28750
58000	29000
58500	29250
59000	29500
59500	29750
60000	30000
60500	30250
61000	30500
61500	30750
62000	31000
62500	31250
63000	31500
63500	31750
64000	32000
64500	32250
65000	32500
65500	32750
66000	33000
66500	33250
67000	33500
67500	33750
68000	34000
68500	34250
69000	34500
69500	34750
70000	35000
70500	35250
71000	35500
71500	35750
72000	36000
72500	36250
73000	36500
73500	36750
74000	37000
74500	37250
75000	37500
75500	37750
76000	38000
76500	38250
77000	38500
77500	38750
78000	39000
78500	39250
79000	39500
79500	39750
80000	40000
80500	40250
81000	40500
81500	40750
82000	41000
82500	41250
83000	41500
83500	41750
84000	42000
84500	42250
85000	42500
85500	42750
86000	43000
86500	43250
87000	43500
87500	43750
88000	44000
88500	44250
89000	44500
89500	44750
90000	45000
90500	45250
91000	45500
91500	45750
92000	46000
92500	46250
93000	46500
93500	46750
94000	47000
94500	47250
95000	47500
95500	47750
96000	48000
96500	48250
97000	48500
97500	48750
98000	49000
98500	49250
99000	49500
99500	49750
100000	50000
100500	50250
101000	50500
101500	50750
102000	51000
102500	51250
103000	51500
103500	51750
104000	52000
104500	52250
105000	52500
105500	52750
106000	53000
106500	53250
107000	53500
107500	53750
108000	54000
108500	54250
109000	54500
109500	54750
110000	55000
110500	55250
111000	55500
111500	55750
112000	56000
112500	56250
113000	56500
113500	56750
114000	57000
114500	57250
115000	57500
115500	57750
116000	58000
116500	58250
117000	58500
117500	58750
118000	59000
118500	59250
119000	59500
119500	59750
120000	60000
120500	60250
121000	60500
121500	60750
122000	61000
122500	61250
123000	61500
123500	61750
124000	62000
124500	62250
125000	62500
125500	62750
126000	63000
126500	63250
127000	63500
127500	63750
128000	64000
128500	64250
129000	64500
129500	64750
130000	65000
130500	65250
131000	65500
131500	65750
132000	66000
132500	66250
133000	66500
133500	66750
134000	67000
134500	67250
135000	67500
135500	67750
136000	68000
136500	68250
137000	68500
137500	68750
138000	69000
138500	69250
139000	69500
139500	69750
140000	70000
140500	70250
141000	70500
141500	70750
142000	71000
142500	71250
143000	71500
143500	71750
144000	72000
144500	72250
145000	72500
145500	72750
146000	73000
146500	73250
147000	73500
147500	73750
148000	74000
148500	74250
149000	74500
149500	74750
150000	75000
150500	75250
151000	75500
151500	75750
152000	76000
152500	76250
153000	76500
153500	76750
154000	77000
154500	77250
155000	77500
155500	77750
156000	78000
156500	78250
157000	78500
157500	78750
158000	79000
158500	79250
159000	79500
159500	79750
160000	80000
160500	80250
161000	80500
161500	80750
162000	81000
162500	81250
163000	81500
163500	81750
164000	82000
164500	82250
165000	82500
165500	82750
166000	83000
166500	83250
167000	83500
167500	83750
168000	84000
168500	84250
169000	84500
169500	84750
170000	85000
170500	85250
171000	85500
171500	85750
172000	86000
172500	86250
173000	86500
173500	86750
174000	87000
174500	87250
175000	87500
175500	87750
176000	88000
176500	88250
177000	88500
177500	88750
178000	89000
178500	89250
179000	89500
179500	89750
180000	90000
180500	90250
181000	90500
181500	90750
182000	91000
182500	91250
183000	91500
183500	91750
184000	92000
184500	92250
185000	92500
185500	92750
186000	93000
186500	93250
187000	93500
187500	93750
188000	94000
188500	94250
189000	94500
189500	94750
190000	95000
190500	95250
191000	95500
191500	95750
192000	96000
192500	96250
193000	96500
193500	96750
194000	97000
194500	97250
195000	97500
195500	97750
196000	98000
196500	98250
197000	98500
197500	98750
198000	99000
198500	99250
199000	99500
199500	99750
200000	100000
200500	100250
201000	100500
201500	100750
202000	101000
202500	101250
203000	101500
203500	101750
204000	102000

Appendix D. National Type Evaluation Technical Committee  
Measuring Sector Meeting  
October 16-17, 1993 Charleston, SC

Outline of Agenda Items

- 1) Handbook 44 Changes
- 2) Audit Trails
- 3) Totalizers for Retail Motor-Fuel Dispensers
- 4) Criteria for Cash Acceptors at Attended Stations
- 5) Remanufactured Equipment Components
- 6) Listing of Vapor Recovery Options on NTEP CCs
- 7) Update on Compact Prover Testing
- 8) Update and Discussion on Work on Classification of Liquids for PD Meters (Family of Liquids)
- 9) Establishing Meter Classes for Handbook 44
- 10) Suitability of Equipment
- 11) Test Procedures for Compressed Natural Gas Meters
- 12) Tolerances for Mass Flow Meters During Type Evaluation Testing
- 13) Manual Volume Entries
- 14) Checklist for Mass Flow Meters
- 15) US/Canada Harmonization

Meeting Summary

1) Handbook 44 Changes

Background/Discussion: The Committee reviewed recommended changes to Publication 14 to reflect changes made at July 1993 National Conference on Weights and Measures (NCWM).

Conclusion: The Committee agreed to make the following changes to Publication 14. New text is indicated by underlining.

*(Note: As noted in Agenda Item 3, the language adopted in paragraphs S.4.1. and S.4.2 of the Liquid-Measuring Devices (LMD) Code may be revised by the NCWM. Consequently, no reference is made to these two paragraphs in the changes suggested to Publication 14 below.)*

Checklist for Retail Motor-Fuel Dispensers:

Code Reference: S.1.6.5. Money-Value Computations

1. A retail computing device shall compute total sale prices for all quantities and unit prices within the range of its quantity and computing capacities.

NOTE: For dispensers which are not capable of complying with the requirements of UR.3.2., UR.3.3., and S.1.6.5., the Certificate of Conformance must be limited to single-tier pricing applications.

NOTE: This requirement does not apply to devices for which the Certificate of Conformance is limited to installations where the devices are used for fleet sales, other price contract sales, and truck stop dispensers used only to refuel trucks.

Code Reference: S.1.6.5.4., Selection of Unit Price

When a product or grade is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made:

- a) using controls on the device; or

- b) using other user-activated controls.

**NOTE:** This requirement does not apply to devices for which the Certificate of Conformance is limited to installations where the devices are used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks).

## 2) Audit Trails

**Background/Discussion:** NCWM action in July changed the Liquid-Measuring Devices Code to specify the minimum form of audit trails for liquid-measuring devices. Attachment B of the paper on audit trails which was included as part of the 1992 S&T Committee report was updated to reflect the new requirements; a draft of the revised Attachment B was distributed to the Committee during the meeting.

**Conclusion:** The Committee briefly discussed the scope and types of changes made to the original paper. Due to the complexity of the original document, the Committee agreed that members should take additional time to review the changes to the paper prior to including it in Publication 14. Committee members will review the revised paper and forward any comments to the technical advisor by November 22. Based on the comments received, a revised draft will be prepared and distributed to the Committee by December 20. Additional comments on the revised draft should be directed to the technical advisor prior to the Interim Meetings in January 1994; the Committee agreed that any members attending the Interim Meetings could hold a brief impromptu meeting if necessary to discuss the comments received. A final draft will be distributed to the Committee with a letter ballot (asking whether or not the document should be included in Publication 14) following the Interim Meetings.

The Committee agreed that Attachment A, which includes the five basic philosophies for sealing and a listing of the features to be sealed, should also be included in Publication 14. It was noted that few changes will be needed to Attachment A since this document did not reference specific code requirements.

## 3) Totalizers for Retail Motor-Fuel Dispensers

**Background:** At the July 1993 annual meeting of the NCWM, the LMD Code of NIST Handbook 44 was revised to include the following requirements for totalizers on retail motor-fuel dispensers.

### S.5. Totalizers.

**S.5.1. Totalizers for Retail Motor-Fuel Dispensers.** - *Retail motor-fuel dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the device. [Nonretroactive as of January 1, 1994. To become retroactive January 1, 1995.]*  
(Added 1993)

**S.5.2. Sealing Totalizers for Retail Motor-Fuel Dispensers.** - *Adequate provision shall be made for sealing a mechanical totalizer in such a manner that the quantity registration on the totalizer cannot be affected. [Nonretroactive as of January 1, 1994. To become retroactive January 1, 1995.]*  
(Added 1993)

Since the annual meeting, a number of questions have been raised to the S&T Committee and the NIST OWM concerning the language that was adopted for totalizers; the intent of the NCWM in adopting language for totalizers; and how the requirements will be interpreted and enforced by weights and measures officials, particularly when a dispenser has both an electronic and a mechanical totalizer.

A letter was distributed to State Weights and Measures Directors by the S&T Committee to recommend deleting S.5.2. and modifying S.5.1., UR.4.1., and UR.4.2. The Measuring Sector was asked to discuss the proposed changes in order to provide recommendations to the S&T Committee.

**Discussion:** The Measuring Sector discussed the comments and positions of the regional associations in response to the S&T Committee's letter. Some Committee members noted that NCWM action to adopt the requirements for

totalizers was primarily intended to address the use of totalizers by fuel tax agencies. While the requirements adopted in July 1993 seemed straightforward, the Committee agreed that a number of issues, such as sealing, need clarification.

It was noted that both mechanical and electronic totalizers have limited volume capacities, and totalizers in some high volume stations may even "roll over" in the course of a week. This renders totalizers of limited value to weights and measures jurisdictions as other than an enforcement tool to determine whether or not further investigation into a device's use is needed. For totalizers to be used other than as a tool, additional specifications, such as maximum capacity and minimum division size, would be needed. Some members questioned whether or not it is reasonable to even require a totalizer unless the NCWM plans to develop meaningful specifications for them. The Committee generally agreed that the resources required to develop such specifications would outweigh the anticipated value to weights and measures officials.

Although the Committee does not support the development of specifications for totalizers, it agreed that requiring a dispenser to have a totalizer is reasonable since it can be a useful enforcement tool and facilitates tracking quantities dispensed during routine testing. Most devices are presently equipped with totalizers, but some older devices are not. The Committee agreed that the costs of retrofitting older devices is not justified by the anticipated benefit to weights and measures.

In the S&T Committee's discussions with weights and measures officials and industry, many questions were raised in attempting to define what constitutes a sealable totalizer with respect to the type of seal and method of sealing. Suggested types of seals ranged from epoxy seals with no identifying mark to pressure sensitive and wire seals. It was noted that placing seals on the ends of the totalizer cables may not satisfy all jurisdictions; for example, some jurisdictions believe that access to the gears driving the totalizers must also be sealed to deter tampering. The Measuring Sector acknowledged the difficulties encountered in defining what constitutes an acceptable means of sealing totalizers. Given the Committee's position on not developing requirements for totalizer capacity and other specifications, the Committee saw no point in trying to further define minimum sealing criteria.

**Conclusions:** Although the Committee does not support the development of specifications for totalizers, it believes that a totalizer should be required on a dispenser. The Committee agreed that there would be little benefit from requiring that totalizers be sealable; however, the totalizer should be non-resettable. The Committee agreed that a device with at least one non-resettable totalizer would meet the needs of weights and measures officials and agreed that the totalizer could be electronic, mechanical, or electro-mechanical. The Committee believes that the requirements for totalizers should be nonretroactive.

The Committee recommends that the S&T Committee consider the following language proposed by the Northeastern Weights and Measures Association in place of the language adopted by the NCWM in July 1993.

- Amend paragraph S.5.1. to read as follows:

S.5.1. Totalizers for Retail Motor Fuel Dispensers. - Retail motor-fuel dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device. [Nonretroactive as of January 1, 1994 1995. ~~To become retroactive January 1, 1995.~~]

- Delete paragraph S.5.2. Sealing Totalizers for Retail Motor Fuel Dispensers.
- Delete paragraphs UR.4.1. Totalizers for Retail Motor Fuel Dispensers. and UR.4.2. Sealing Totalizers for Retail Motor Fuel Dispensers.

#### 4) Criteria for Cash Acceptors at Attended Stations

**Background/Discussion:** At its October 1992 meeting, the Committee reviewed and made revisions to a proposed checklist for cash acceptors in attended stations, "Checklist for Cash-Activated Retail Motor-Fuel Dispensers, Attended Locations." The revised checklist was distributed to Committee members for review along with an alternative proposal from Gilbarco, Inc. The Committee was asked to provide additional comments prior to incorporating the checklist into Publication 14.



At the Committee's last meeting, several Committee members indicated an interest in working together to develop suggested language for the use of the cash acceptor option in unattended locations.

**Conclusions:** The Committee agreed to add the term "or equivalent" following the references to "battery back-up and uninterruptible power supply" to recognize that other alternatives are available to ensure that a system can continue to operate in the event of a power failure. The Committee agreed that the checklist should be included in Publication 14 with this revision.

Committee members acknowledged that few requests have been received for use of card-activated retail motor-fuel dispensers in unattended sites; it was noted that local and state fire codes prohibit unattended operation of these devices in many areas. At some future time Committee members may wish to address the use of these devices in unattended locations; in this event, members of the Gasoline Pump Manufacturer's Association agreed to review the existing criteria and propose those changes, if any, that would be needed to the checklist to evaluate these devices for use in unattended locations.

## 5) Remanufactured Equipment Components

**Background:** The Measuring Sector established criteria for remanufactured devices at its October 1992 meeting, agreeing that further work is needed to develop a policy for repair of *components used in existing installations*. Mr. Gordon Johnson, Gilbarco, drafted language for such a policy which was distributed to the Committee for comments. A summary of the diverse comments received from Committee members on this item was distributed, indicating that additional discussion is needed.

When a Certificate of Conformance (CC) is issued to a device, the original equipment manufacturer has the responsibility to continue to manufacture the device consistent with the device originally submitted to NTEP. If the device is altered in the field through modification or repair, the alterations may affect the device's ability to comply with Handbook 44. The field official may require guidelines to determine whether or not a CC has been invalidated as a result of such modifications or repairs.

NTEP has established criteria for weighing devices which define what changes can be made to a device without invalidating the CC; these criteria were developed due to influence factors considerations. For example, when a load cell is repaired or replaced, specific criteria are used to determine whether or not the original CC still applies to the repaired scale.

**Discussion:** Many Committee members indicated that they are comfortable with the guidelines developed for remanufactured (complete) devices; however, they expressed concerns about the proposed criteria for addressing components of devices. Among the concerns was that weights and measures officials in the field have no way of knowing whether or not a component has been remanufactured (although the original equipment manufacturer can usually determine this rather easily). There are no requirements in Handbook 44 for components of measuring devices to be marked with identifying information; even if the components were marked, it would not be feasible for weights and measures officials to verify whether the component was original or if it had been rebuilt or remanufactured and simply not marked as a remanufactured component by the remanufacturer.

The intent of the proposed requirement was not to evaluate the performance of an individual component, but rather the performance of a device with that component. Given the numerous possible combinations of remanufactured components in devices, it was noted that NTEP would have difficulty determining whether or not a component would affect the compliance of a given device.

It was commented that NTEP has no criteria for evaluating individual components of metering systems. If a remanufacturer were to ask NTEP to evaluate a particular component for compliance with Handbook 44, NTEP has no criteria by which to perform the evaluation on the component alone. NTEP cannot justify limiting the manufacture of components to the original equipment manufacturer unless it can be demonstrated that a remanufactured component affects the capability of the device to comply with the applicable requirements.

The Committee also noted that, unlike weighing devices whose performance cannot easily be verified in the field for some requirements, such as temperature, the performance of liquid-measuring devices can typically be verified in the

course of a routine field inspection. Thus, if a device does not comply with Handbook 44 due to a remanufactured component, the field official will reject it for failure to comply with routine inspection requirements.

Many Committee members believe that faulty remanufactured components are best addressed by the original equipment manufacturer, the remanufacturer, and the local weights and measures jurisdiction on a case-by-case basis. Some manufacturers indicate that this is a customer service issue, rather than a weights and measures or NTEP issue, since the device owner typically calls the original equipment manufacturer if a malfunction occurs or the device is rejected by weights and measures officials. If a device malfunctions or is rejected, the original equipment manufacturer can usually determine when the problem is attributable to non-OEM parts; the owner of the device is then usually given the option to work the problem out with the remanufacturer or replace the components with OEM or equivalent parts.

**Conclusion:** Most Committee members agreed that it would be beneficial to have some means of ensuring that replacement components are of equal quality to the original components; however, it is not feasible for NTEP to address this issue and it is not possible for weights and measures to control. Consequently, the Committee concluded that no criteria should be established for remanufactured components for measuring devices.

## 6) Listing of Vapor Recovery Options on NTEP CCs

**Background:** At its November 1990 meeting, the Committee addressed the issue of how vapor recovery options are referenced on NTEP CCs; the Committee added language to the checklist to address cases in which (1) no testing has been done on the vapor recovery equipment, and (2) NTEP testing is done on equipment which uses vapor recovery equipment which has been tested by the California Air Resources Board (CARB). The Committee was asked to consider adding language to the checklist to address a third case which was not addressed in the original language: "When NTEP testing is performed on a device that is equipped with vapor recovery equipment, but no CARB testing has been performed on the vapor recovery equipment."

**Discussion:** The Committee noted that this issue was originally discussed in 1990 in response to requests from manufacturers to include listings of vapor recovery options on CCs. NTEP does not test the vapor recovery equipment for compliance with CARB requirements, and participating laboratories other than California Division of Measurement Standards do not perform tests to determine compliance of the vapor recovery equipment with Handbook 44 requirements for diversion of product. Since many States rely on NTEP CCs as a basis for determining initial acceptance of the device, NTEP wants to ensure that inclusion of the vapor recovery option does not imply that NTEP has performed testing on those components for compliance with air resource board requirements.

Committee members noted that weights and measures jurisdictions which have requirements for compliance with CARB or equivalent standards should not rely on the NTEP CC alone; they should require a separate certificate from CARB or an equivalent agency. It was indicated that, when an NTEP CC lists a vapor recovery option, it is not always clear to a weights and measures official whether or not NTEP has performed some testing on the vapor recovery equipment; weights and measures officials must have a clear indication of the testing performed by NTEP.

Concerns were also expressed that when a CARB Certificate is changed, or perhaps revoked, NTEP may not be aware of the changes and, consequently, not update the NTEP CC to reflect the changes.

**Conclusion:** The Committee agreed that it is best to limit statements on the CC to indicate only which tests have been performed by NTEP. The Committee agreed to modify the existing language in the Liquid Measuring Devices Checklist of Pub 14 as follows:

- (1) ~~If a device has had no vapor recovery testing performed, the "vapor recovery" and/or the "vapor recovery ready" option can be listed on the NTEP Certificate of Conformance and a statement will be included on the Certificate of Conformance to indicate this. For example: "No NTEP testing was performed on the Model ABC dispenser equipped with vapor recovery equipment or on the vapor recovery equipment to be used with the Model ABC dispenser."~~
- (2) ~~If the vapor recovery equipment used by a manufacturer has a CARB certificate for the vapor recovery equipment, one of the following actions should be taken:~~

- ~~(a) if there is an existing NTEP CC issued to a device which uses the same vapor recovery equipment, reference this existing NTEP CC on the CC under consideration; OR~~
- ~~(b) if there is no existing NTEP CC issued to a device which uses the vapor recovery equipment, then reference the CARB CC [executive order number].~~

If a retail motor-fuel dispenser includes a vapor recovery option, the following statement will be included on the Certificate of Conformance: "No NTEP testing has been performed on the device equipped with vapor recovery option or equipment to determine compliance with air resources board requirements."

## 7) Update on Compact Prover Testing

**Background/Discussion:** At the Committee's October 1992 meeting, the Committee agreed that NTEP should recognize the use of compact provers for laboratory and field portions of type evaluation testing. The Committee had also noted that additional data would be needed before a decision can be made regarding whether or not NIST will recognize compact provers for use as acceptable substitute legal standards in place of the neck-type prover or gravimetric testing. Mr. Tim Scott, Brooks Instruments, agreed to develop a plan for comparison testing between volumetric neck-type provers and compact provers.

Mr. Scott has outlined a plan with provisions for demonstrating the calibration of a compact prover and for comparing the operation of the volumetric neck-type prover with the compact prover; he provided a detailed copy of the plan to the technical advisor prior to the Sector meeting and reviewed the highlights of his proposal with the Committee:

*Factory Tests:* Testing of the compact prover will be performed at the Brooks Statesboro, GA facility, including hydrostatic pressure testing, upstream/downstream volume waterdraw, functional flow test with turbine flow meter.

*Laboratory Tests:* The compact prover will be transported to a designated state or NIST laboratory location for testing in comparison with other established reference devices; round robin testing may be performed as recommended by NIST.

*Field Tests:* Testing will be arranged at field installations of loading rack meters where the compact prover can be installed in series with a volumetric neck-type prover. The results of both proving methods can be compared for test runs of both positive displacement and turbine meters. These tests can be witnessed by weights and measures officials; Florida and North Carolina were identified as possible field sites.

During the discussion of the proposed test plan, Committee members questioned whether or not comparisons will also be made with mass flow meters. Mr. Scott indicated that they plan to include mass flow meters in the comparison.

The Metrologists' Group is the NCWM body responsible for evaluating proposed test methods and devices used in routine field testing of weighing and measuring devices. It can assess whether or not a device such as the compact prover is acceptable as a substitute legal standard in place of the neck-type prover or gravimetric testing. It was suggested that Mr. Scott work closely with the NCWM Metrologists' Group on this project and request it to address this issue.

The Measuring Sector's technical advisor will provide the background information supplied by Mr. Scott to Ms. Georgia Harris, NIST, technical advisor for the Metrologists' Group. Mr. Scott will also contact Ms. Harris to request that the Metrologists' Group consider addressing the subject.

## 8) Update and Discussion on Work on Classification of Liquids for PD Meters (Family of Liquids)

**Background & Conclusions:** At the Committee's last meeting, the Meter Manufacturer's Association (MMA) indicated that it would be continuing work on this issue with respect to further defining accuracy classifications (including a review of tolerances for agri-chemical meters) and modifying existing families of liquids as needed.

Mr. Tim Scott, Brooks Instruments, addressed the Committee on behalf of the MMA. He indicated that the family of liquids issue is an ongoing topic for the MMA, and a document with proposed revisions is currently circulating among

MMA members for review and comment. Mr. Scott indicated that the MMA will provide an update to the Committee following this review period and will supply information for discussion at the next meeting of the Committee.

The MMA agreed to address the possibility of adding one or more categories to address food products. It was noted that this can include a wide range of products with varying viscosities or other characteristics, for example, viscous products like peanut butter and products which must be maintained at a given temperature, such as liquid sugar. The MMA also agreed to address CO<sub>2</sub> in its work on product classifications. (NOTE: See also combined agenda items (9) and (10) for related discussions on the topic of Meter Classes and Suitability of Equipment.)

## 9) Establishing Meter Classes for Handbook 44 & 10) Suitability of Equipment

(Note: The Committee agreed that Agenda Items (9) and (10) were closely related and, therefore, addressed them in a single discussion.)

**Background/Discussion:** The concept of separating meters into "classes" was briefly noted at the Committee's October 1992 meeting during the discussion on families of liquids for positive displacement meters (See agenda Item 8). This concept is used by the International Organization for Legal Metrology (OIML) for positive displacement and other types of meters.

In a related issue, Committee members were provided with a copy of Item 330-8 of the 1993 final report of the S&T Committee, which discusses a proposal to include suitability of equipment criteria for liquid-measuring devices in Handbook 44. The proposal outlined suggested suitability criteria in the form of a table with minimum delivery sizes, maximum division value, and required accuracy. The S&T Committee seeks input from the Measuring Sector on this issue.

Committee members noted that NCWM discussions on suitability of equipment for liquid-measuring devices originated primarily as a result of difficulties encountered by field officials in distinguishing between wholesale and retail devices. Handbook 44 does not adequately define the various applications for liquid-measuring devices encountered by field officials. The definition for retail may not address all applications of devices which should fall into the retail category, and the definition for wholesale devices is vague. Many weights and measures officials believe that Handbook 44 criteria are needed in order for the criteria to be enforceable and to ensure that all weights and measures officials, manufacturers, and service companies have access to the information.

The concept of establishing a table to define suitability of equipment for given applications was based on a similar approach used in the Scales code. Committee members noted that much confusion has arisen over how the proposed table is intended to apply, particularly because the tolerances in the table often differ from the tolerances in the specific code for a given device. It was noted that the tolerances in the table simply define the tolerance that must be met in order for a device to be considered suitable for a specific application.

Another area of particular concern to some Committee members was the restriction of the division size on analog devices to 0.01 gal or smaller. It was noted that this is a nonretroactive restriction, applying only to new *models* of devices, not to existing models already in production; under the proposal, existing models could continue to be produced and used in these applications. In proposing this restriction, the S&T Committee was recognizing that technology has developed to the extent that a 0.1 gallon division size is no longer considered suitable for delivery sizes of 10 gallons since alternative devices with higher resolution are readily available.

The concept of using accuracy classes, device divisions, and minimum delivery sizes to define suitability of equipment is new for liquid-measuring devices, although the Committee noted that OIML has established the use of accuracy classes for metering devices. It was noted that minimum delivery size is an important concept in this approach in order to keep the error small relative to the size of the delivery. Committee members also noted that flow rate may be an additional parameter to consider when addressing suitability.

**Conclusions:** The Committee agreed that the concept of establishing accuracy classes, minimum division sizes, and minimum delivery sizes has merit; however, detailed study is needed beyond what the Committee can accomplish during a given meeting. The Committee agreed that this work would best be done by a subgroup which would make recommendations to the Committee.



The following people agreed to be on the subgroup: Mel Hankel (Liquid Controls Corp.); Jack Jeffries (FL); Ron Murdock (NC); Chuck Strawn (Schlumberger Industries); and Rich Tucker (Tokheim Corp.). The subgroup was asked to review the concepts of accuracy class, division size, and minimum delivery relative to specific applications. It will report its findings to the technical advisor, who will distribute the information to the Committee for consideration.

## 11) Test Procedures for Compressed Natural Gas Meters

**Background/Discussion:** A draft examination procedure outline (EPO) for CNG has been developed by Jim Akey (WI) on behalf of the NCWM Metrologist's Group and distributed to Committee members for review. Several NTEP tests have been performed on CNG meters in retail-motor fuel applications using the NTEP criteria and test procedures for mass flow meters. More specific procedures are needed for mass flow meters dispensing compressed natural gas due to the nature of the product and concerns about the use and operation of these devices.

The NCWM Laws and Regulations Committee and the Specifications and Tolerances Committee are working with members of the Natural Gas Vehicle Coalition (NGVC) and other representatives from the CNG industry to establish the method of sale for CNG in retail motor-fuel applications. These groups are also working to identify adequate procedures for routine field testing. The Committee was asked to review the proposed EPO for CNG meters to determine how these procedures might be incorporated into Publication 14 and possible changes to the document. The Committee was also asked to consider establishing a subgroup to work with the NGVC on the further development of test procedures.

During the meeting, the Committee was advised that Dick Suiter, Nebraska Weights and Measures, has also developed an examination procedure outline based on Nebraska's experience performing routine tests of these devices. Committee member, Steve Malone (NE W&M) noted that the primary difference between Nebraska's proposed procedure and the EPO distributed to the Sector is that Nebraska stipulates comparison of the indicated values with the scale rather than comparison with derived values (i.e., calculated values). Nebraska's procedure also reflects many safety concerns that their inspectors have encountered.

**Conclusions:** The Committee agreed that a subgroup should be formed to work with the NGVC on the development of test procedures for these devices for both type evaluation and routine field testing, and that Jim Pekor (NGVC) should be advised. Those agreeing to serve on the subgroup are: California W&M (no specific representative at present, most likely will be Charlie Nelson); Daniel Industries (no specific representative at present); Chuck Miller (DVCO); Gordon Johnson (Gilbarco); Mike Keilty (Micromotion); and Richard Huff (Universal Epco). Mr. Keilty agreed to coordinate the efforts of this group with the work being done by the NGVC.

The Committee noted that the proposed EPOs cover mass flow meters, but Committee members noted the need to address other technologies, such as sonic nozzles, turbine or other types of meters. Questions were raised particularly concerning how the sonic nozzle can determine BTU content of the measured product.

Another area identified by the Committee as needing further development is the disposal or return of product following testing. Many concerns have been raised about the appropriateness of expelling the product back into the atmosphere. While air resources boards may not object to this practice, many fire marshal codes prohibit this for safety reasons and, in some cases, stipulate safety specifications for the equipment.

## 12) Tolerances for Mass Flow Meters During Type Evaluation Testing

**Background/Discussion:** At its July 1993 annual meeting, the NCWM added paragraph T.5. to the tentative Mass Flow Meters Code to specify a tolerance of 0.3 percent during type evaluation. The intent of part (b) of this paragraph is to specify that a tolerance of 0.3 percent applies at a given temperature and pressure.

As part of a type evaluation field test, a mass flow meter will be tested initially and then again after a specified amount of product (throughput) has gone through the meter. There will likely be a difference in the temperature of the liquid between the initial and subsequent tests. Despite such differences, the tolerance of 0.3 percent is applied to the meter during each test, and no meter adjustment is permitted between the initial and subsequent tests. The Committee was asked to consider modifying Publication 14 to clarify this point and to reflect the addition of the new paragraph T.3.



A number of concerns were raised by Committee members over the differences in tolerance applied to different types of meters, specifically, mass flow meters vs. positive displacement, turbine, and other types of meters. For example, during type evaluation, positive displacement meters have a larger tolerance than mass flow meters for agri-chemicals; for products categorized as "other liquids" the opposite is true. Since all references to mass flow meters will be removed from the specific codes when the mass flow meter code becomes permanent, the Committee is particularly concerned that this issue be addressed.

Manufacturers expressed a general desire to see all types of metering technology treated equally for a given application. Committee members noted that the establishment of meter classes with specific tolerances and applications (as noted in agenda items 9 and 10) might help to eliminate the discrepancies which currently exist among the various measuring device codes. Committee members were advised that Canada is currently considering meter classes for its mass flow meter requirements; using this approach might assist in future harmonization efforts in the measuring device area.

**Conclusions:** Since the proposed change merely clarifies requirements already recognized in Handbook 44, the Committee agreed that Publication 14, Part (H), Field Evaluation and Permanence Tests for Metering Systems, under the section titled "Permanence Tests for Mass Flow Meters" be modified by adding the note shown (in underlined text) below and adding the word "liquid" prior to "temperatures and pressures" in the last sentence of the note. However, the Committee noted that many of the issues identified in the discussion of this issue must be further addressed. Some of the concerns raised might be addressed through the establishment of meter classes. The Committee agreed that these issues should be dealt with by the subgroup established to examine meter classes and suitability of equipment (see combined agenda item numbers 9 and 10).

Modify Publication 14 as follows:

**Test Data** The following tests are considered to be appropriate for mass flow meters:

- five tests at each of four different flow rates across the range of the meter

All data points must fall within the maximum permissible error limits.

Following the initial test, the meters will be placed into service for the permanence test. The following minimum throughput criterion is recommended for these meters.

60 days OR

2,000 x maximum flow rate achieved in the installation, whichever is greater

Following the period of use, the tests listed above are to be repeated. All results must be within acceptance tolerances.

**NOTE:** The specified tolerance of 0.3 percent is to be applied to both the initial and the final tests. No adjustments may be made to the meter between these tests. The tolerance is to be applied even if liquid temperatures and pressures differ between the initial and final tests.

### 13) Manual Volume Entries

**Background:** In January 1993, Committee members agreed by letter ballot to modify the checklist for Electronic Cash Registers (ECRs) Interfaced with Retail Motor Fuel Dispensers (RMFDs) to permit manual fuel entries as follows. Committee members were provided with a summary of the comments received in conjunction with the letter ballot.

2. Manual volume entries other than preset amounts are not permitted when the dispenser is "on-line" with the ECR. Manual volume entries are permitted when:
  - (a) the dispenser is "off-line" with the ECR and
  - (b) the entry is clearly identified on the receipt as a manual entry by the terms "MANUAL VOLUME", "Manual Volume", "MAN VOL", "Man Vol", "MANUAL ENTRY", or "Manual Entry".

[Editor's note: The term "on-line" indicates that the dispenser is interfaced with and can communicate with the ECR. The term "off-line" indicates that the interface between the dispenser and the ECR is not functioning and the dispenser cannot communicate with the ECR.]

In the letter ballot, most Committee members agreed that the term "MANUAL VOLUME" or "Manual Volume" are acceptable to identify the entry on the printed receipt. Although the terms "MAN VOL" or "Man Vol" and "MANUAL ENTRY" or "Manual Entry" were considered acceptable by a majority of Committee members, a fair number of Committee members opposed these terms. Committee members were asked to discuss these latter terms further.

Among the comments received with the responses to the letter ballot was a request to permit the use of manual fuel entries when the system is in an "on-line" mode in order to permit corrections to mischarged sales.

**Discussion:** The discussion of this issue questioned the basis for permitting manual fuel entries since they are not specifically referred to in Handbook 44. Committee members noted that, despite this lack of mention, the ECR/RMFD checklist has for some time prohibited their use. The Measuring Sector previously believed that use of manual fuel entries facilitated fraud and included this language as an interpretation of the General Code paragraph G.S.2., which prohibits features that facilitate fraud. The Measuring Sector has since (in their letter ballot) reassessed this interpretation and, as a result of the letter ballot, agreed to permit manual fuel entries under specific conditions.

Concerns were also raised over whether the S&T Committee, rather than the Measuring Sector, should review this issue, and whether a change to Handbook 44 is needed to permit manual fuel entries. Committee members noted that the S&T Committee has the authority (as does the NTEP Board of Governors) to override any decisions made by the Measuring Sector if the decisions of the Sector are not felt to be consistent with Handbook 44 requirements. Additionally, the NCWM can question the decisions and interpretations made by the sectors since the summaries of the technical sector meetings are typically included as appendices to the Executive Committee's report.

The chairman of the NTEP Board of Governors, Allan Nelson, confirmed this hierarchy and briefly reviewed the role of the technical sectors in providing reasonable interpretations based on their knowledge of Handbook 44 requirements and their practical expertise. Committee members further noted that the NCWM does not typically review step-by-step and discuss each decision of the technical sectors in detail, and reopening each issue would defeat the purpose of appointing the sectors. The sectors have been charged with the responsibility of making these decisions based on thorough technical discussions, which are typically not possible in the framework of the NCWM open hearings.

Committee members noted that, if the role of the Sectors is not to develop criteria and provide interpretations, then the Sector should be disbanded or redefined. In addition, if the Sector overrides the wishes of the NCWM, it should receive that feedback.

Some Committee members opposed the direction of the Committee on this issue, believing that it is making decisions not based on H44 criteria, and that the S&T must review this issue first. Since there were strong feelings in both directions, the Committee voted 11 to 5 against forwarding the issue to the S&T Committee for review prior to deciding. However, the Sector reiterated its understanding that the S&T Committee still has final authority over all decisions made by the Sector.

In the technical discussion of the issue, some weights and measures officials indicated that they would allow any of the proposed terms since all would permit a weights and measures official to identify a manual entry in the event of a consumer complaint. Some Committee members noted that one of the primary concerns is to make sure that the customer can understand the designation of a manual fuel entry.

The primary need for "on-line" manual fuel entries is to be able to correct for cashier errors. For example, the cashier who clears the wrong dispenser when a customer comes in to pay needs some means to re-enter the cleared information for the appropriate customer.

**Conclusions:** The Committee agreed to permit manual fuel entries while the dispenser is "on-line" with the ECR by modifying the ECR/RMFD checklist as follows. The permissible terms identified by the Committee for designating a manual fuel entry are also included in the modified text.

2. ~~Manual volume entries other than preset amounts are not permitted when the dispenser is "on-line" with the ECR. Manual volume entries are permitted when:~~

~~(a) the dispenser is "off line" with the ECR and~~

~~(b) The entry is must be clearly identified on the receipt as a manual entry by the terms "MANUAL VOLUME", "Manual Volume", "MAN VOL", "Man Vol", "MANUAL ENTRY", or "Manual Entry". "Manual Volume," "Manual Fuel Entry," "Manual Entry," "Manual Sale," or "Manual Fuel Sale." (Note: All uppercase or a combination of upper and lower case letters are permitted, provided the resulting text is found to be clear and legible by the evaluating laboratory.)~~

~~(c) the ECR will not accept manual entries when "on-line" with dispensers.~~

## 14) Checklist for Mass Flow Meters

**Background/Discussion:** Handbook 44 currently includes a tentative code for mass flow meters. The NCWM has made revisions to the tentative code over the past several years and it is proposed that its status be changed from tentative to permanent next year. A number of mass flow meters have been evaluated by NTEP over the past several years using testing criteria established by the Measuring Sector at past meetings. When the tentative code becomes permanent, references to mass flow meters in other codes will be deleted.

In anticipation of the code becoming permanent and to better address NTEP testing of mass flow meters, the Committee was asked to discuss the possible development of a separate checklist for mass flow meters.

Committee members noted that this issue is closely tied with the work of the subgroup established to develop test procedures for CNG dispensers since many of them use mass flow meter technology. Committee members urged the group to consider moving forward on the development of a proposed checklist based on the tentative code in anticipation of the eventual acceptance of the mass flow meters code by the NCWM. Any changes made in the tentative code can still be tracked in the proposed checklist. A checklist based on the proposed mass flow meters code would not be finalized until the status of proposed code is made permanent; however, since other codes recognize the use of mass flow meters, many of the testing procedures could be used by participating laboratories.

The Committee was asked for input to the S&T Committee on whether or not the tentative mass flow meter code should be made permanent. Concerns were expressed over the discrepancies in tolerances among the various codes and other unresolved questions. This issue might be addressed in the discussion on meter classes and suitability of equipment (see Agenda Items 9 and 10).

**Conclusions:** The Committee agreed that a subgroup should develop a proposed checklist for mass flow meters in anticipation of the NCWM's eventual acceptance of the tentative mass flow meter code. The following people agreed to serve on the subgroup: Eric Kappelt (per John Skuce) (Smith Meter), Mike Keilty (Micromotion), and Chuck Strawn (Schlumberger Industries). Mr. Keilty agreed to serve as chairman of the subgroup and to coordinate the efforts of this subgroup with that of the subgroup working on test procedures for CNG dispensers. The subgroup will bring its recommendations back to the Committee for review and comment.

Due to the remaining concerns over the discrepancies in tolerances among the various codes, the Committee puts forth no recommendation to the S&T Committee concerning the status of the tentative mass flow meters code.

## 15) U.S./Canada Harmonization

**Background/Discussion:** In Fall 1992, members of the NCWM (including weights and measures officials, industry, and members of the NIST Office of Weights and Measures) met with representatives from Canada's Legal Metrology Branch to discuss the harmonization of U.S. and Canadian weights and measures requirements as a means of eliminating trade barriers for equipment manufacturers. Members of the weighing industry indicated that their main objective was to recognize type evaluation tests by either the United States or Canada as acceptable, rather than harmonizing the weights and measures requirements.

In April 1993, the U.S./Canada Mutual Recognition Work Group adopted a plan to develop a program in which a manufacturer can submit a weighing device to either country and have it evaluated for U.S. and/or Canadian type approval, eliminating the need to go through the type evaluation process in both countries. The group agreed that a basic set of tests would address requirements which the two countries have in common, and a separate set of tests would be run for areas where the two countries differ.

Over the past year, representatives of Canada's Legal Metrology Branch have worked closely with members of the participating NTEP laboratories to identify the similarities and differences between U.S. and Canada's type evaluation testing procedures and policies for several categories of weighing devices. As part of this process this subgroup is developing a unified checklist, application form, and applicant's guide which will be used by the type evaluation laboratories to evaluate certain weighing equipment for both countries. It is anticipated that this program will be implemented sometime in 1994. If this program proves to be successful, it will be expanded to include other types of weighing devices.

The NCWM wants to explore the issue of U.S./Canada harmonization with manufacturers of liquid-measuring devices in anticipation that a program similar to that developed for weighing devices might be implemented for liquid-measuring devices sometime in the future. This issue was brought before the Measuring Sector to update the Committee with the work being done in the weighing area and to provide an opportunity for Committee members to give some preliminary input on what approach might work best for the liquid-measuring device industry.

NTEP Board of Governors Chairman, Allan Nelson, reviewed this issue with the Committee. He noted that the issue is more appropriately addressed as mutual recognition within the weighing industry where the focus is to attain mutual recognition of type approval rather than making the requirements of the two countries the same. Mr. Nelson reported that the work within the weighing industry is proceeding well and noted that training of NTEP participating laboratories in the Canadian requirements for certain weighing devices is scheduled for December.

Mr. Nelson asked the measuring industry and weights and measures officials to consider how this issue might best be addressed for the measuring industry. He noted that they should consider whether the mutual recognition approach used by the weighing sector or the approach of harmonizing requirements would best suit the needs of the measuring industry.

Due to the limited time available to the Sector, little input was given by the group; however, Mr. Nelson encouraged the group to give further thought to the issue and provide their input to the NTEP Board of Governors on this issue to assist the Board in planning for future work in this area.

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**Appendix E. National Type Evaluation Technical Committee  
Moisture Meter Sector  
December 17-18, 1991**

**INTRODUCTION**

The agenda for the two day meeting is listed below.

- I. Goals and scope of the Committee
- II. Handbook 44 Code considerations
  - A. Moisture measurement technologies to be considered by the Committee
  - B. Mass, temperature, and test weight measurements
  - C. Reference method
- III. Type Evaluation Considerations
  - A. Instrument calibration
    1. Calibrations used for type evaluation testing
    2. Ongoing national calibration effort
  - B. Grain types and classes
  - C. Test procedures and tolerances
    1. Basic accuracy and precision tests
    2. Verify operating ranges for the instrument.
  - D. Sample selection and preparation
- IV. Discussion and Planning for Upcoming Meetings
  - A. Issues requiring discussion at future meetings
  - B. Scheduling the next meeting

Sid Colbrook (Chairman, NCWM), Carroll Brickenkamp (NIST), and Dave Funk (FGIS) welcomed sector members to the organizational meeting. Selected comments are summarized below as part of the discussion on goals and scope of the Moisture Meter Sector. These remarks also apply for the Near-Infrared (NIR) Wheat Protein Analyzer Sector.

Discussion of "Type Evaluation Considerations" did not proceed according to the agenda shown above. Consideration of the first issue "Instrument Calibration" led to a more general discussion of type evaluation requirements. This discussion was summarized and reported under five general categories: (1) General Approval Approach, (2) Instrument Calibration, (3) Sample Set Selection, (4) Tolerances, and (5) Sealing Instruments.

**RESULTS AND DISCUSSION**

**I. Goals and scope of the Committee**

The primary responsibility of these National Type Evaluation Technical Committee sectors is to develop type approval requirements for moisture meters and NIR wheat protein analyzers. The sectors are also charged with making parallel changes to the Handbook 44 Grain Moisture Meter code and with developing new code for NIR protein analyzers.

NCWM is a standards writing body, and like most standards writing bodies, requires that only members may participate in the process, including technical sector activities. Membership applications were distributed at the meeting. Rather than resolving issues by bringing them to a vote, the sectors shall attempt to reach a consensus. Consensus was defined as "more than a majority but less than unanimity."

Sector activities will be consistent with the organizational structure and operational procedures of NCWM. Sectors may make recommendations on policy issues that will then be forwarded to the Executive Committee of NCWM for consideration. Recommendations on technical issues will be forwarded to and voted upon by the Specifications and Tolerances Committee.

The NCWM Chairman and the Chief of the Office of Weights and Measures worked to appoint members to the sectors. During this process, they responded to questions and provided information to sector members. Now that the sectors have

been established, they should no longer be considered as primary contacts regarding sector activities. Inquiries should be directed to either the Technical Advisor or the Chairman of the Sector.

Type evaluation criteria need to be a reasonable interpretation of the appropriate code in Handbook 44. Type evaluation tests need to be developed for all features that will be listed on the Certificate of Conformance.

The sectors need to address "direct sale considerations." Both the customer and seller are entitled to equal information at the time of sale. Instruments should be designed in such a fashion that they do not "facilitate fraud."

## II. Handbook 44 Code considerations

### A. Moisture measurement technologies to be considered by the Committee

#### Results of the Meeting

The sector discussed whether moisture measurement technology should be limited by Handbook 44 code, to what extent instruments can be sealed, and whether current Handbook 44 tolerances should be maintained.

1. Sector members agreed that technology should not be limited by Handbook 44 code, and that type evaluation test criteria should emphasize performance specifications rather than design features. The Technical Advisor was assigned the task of reviewing the literature and providing information on minimum acceptable sample sizes for moisture meters.
2. The Technical Advisor will also provide a technology update at the next meeting regarding means of sealing instruments or otherwise deterring fraud.
3. It was recommended that the present maintenance tolerances in Handbook 44 be maintained. This assumes that field test samples are screened to achieve good agreement between moisture meter and air oven results.

#### Discussion

1. The consensus of the group was that Handbook 44 code should be general enough that it does not limit the development and adoption of new moisture measurement technologies. This does not imply that all technologies will be suitable for commercial use. The intent is that the emphasis be placed upon performance, not design considerations. It was determined that the sector can and should define what data needs to accompany an application for type evaluation to show that the instrument potentially meets test criteria. Publication 14, not Handbook 44, is the appropriate place to specify application requirements.

It was suggested that it would be easier to develop performance specifications if we limited discussion to those types of technology that we understand, e.g., capacitance meters, DC conductivity meters, and NIR analyzers. The concern was that different test procedures will be required for different measurement technologies, and that developing type evaluation criteria would be more difficult if no technologies were eliminated.

In the discussion on including or excluding specific technologies, it was proposed that any moisture measurement system accepting a whole grain sample and providing a moisture reading be considered a grain moisture meter. Thus, a "moisture meter" might consist of several pieces of equipment and require a number of different steps to make a moisture determination. For example, it would be acceptable to have a grinder included as part of the system if the performance of the overall moisture measurement system meets type evaluation test requirements. Auxiliary equipment and analysis procedures would be specified on the Certificate of Conformance. Devices intended for use in measuring the moisture of processed grain commodities (flour) should be excluded from consideration.

It was agreed that there should be no limit on the time required to make a moisture determination. Rather, the marketplace should be relied upon to discourage unrealistic analysis procedures. The priority placed upon analysis time depends upon the situation and the specific application.

Sample size was identified as one of the more critical design considerations. Discussion included the importance of obtaining a representative sample from the bulk lot, use of proper subsampling techniques, and the fact that air oven reference methods use only a small amount of sample. Questions posed by the group included: Should minimum sample

size requirements be described on a weight or volumetric basis? Does sample size matter if we get the correct result? How large a sample is required in order to get repeatability? This issue was not resolved.

It was agreed that Handbook 44 code should continue to exclude testing of in-motion moisture measurement devices. Concern was expressed that grain moves through some instruments during analysis, and that this might be defined as in-motion moisture measurement. It was suggested that a static moisture measurement be defined as one where the sample is retained by the instrument after the analysis is complete.

2. Considerable discussion regarded direct sale considerations and the fact that some instruments, NIR analyzers in particular, may more readily facilitate fraud than other instrument types. There was concern that operational procedures differ from those for dielectric meters. NIR operators normally make frequent bias checks, adjusting instrument results up or down as required. There was discussion regarding how frequently NIR's need to be biased for moisture. It was suggested that bias checks might not need to be as frequent for moisture as they are for protein because the moisture bands are strong and may be inherently more stable. The group discussed whether some type of audit trail would be required for NIR instruments.

It was acknowledged that, though some dielectric meters can be largely sealed, all instruments currently in use to some extent facilitate fraud. Meters requiring conversion charts were cited as an example. In addition to the opportunity for fraud, the possibility of operator error is greater with these instruments. NCWM wanted to specify the use of fully automatic meters at the time the moisture meter code in Handbook 44 was developed; is now the time to specify the use of fully automatic moisture meters?

The Technical Advisor was tasked with providing a technology update regarding methods, other than sealing the instrument, of preventing fraud. One suggestion was that NIR manufacturers design safeguards into the instrument, but several years might be required to develop software to lock out the operator from some features. Another suggestion was that the bias setting be printed with the moisture result.

3. The sector did not feel that any changes were required to current Handbook 44 acceptance and maintenance tolerances. Representatives from state Weights and Measures offices reported few problems with the tolerances when using preselected field test samples. Meter rejection rates from 0.5 to 5.0% were reported by the various state representatives.

B. Mass, temperature, and test weight measurements

#### Results of the Meeting

The sector recommended that existing tolerances for auxiliary equipment (that is, equipment which is separate and external from the moisture meter) be maintained. Internal devices providing intermediate temperature, test weight, or mass measurements used to adjust moisture values do not need to be tested unless the intermediate result will be reported and used for purposes of trade.

#### Discussion

Most of the discussion was to clarify existing Handbook 44 code to make it clear that internal devices will not be tested as part of type evaluation, and that the primary performance requirement is that the instrument provide accurate moisture results. If intermediate results are printed or displayed, the display should indicate that these results are "not legal for trade." A question was asked regarding how this requirement affects an NIR that is approved for making moisture determinations but not protein determinations. The response was that the same restrictions apply as far as displaying information.

There was some discussion that the tolerances for external devices may be unrealistic. For example, requirements for moisture scales might not be practical because weighing error does not necessarily translate into a moisture determination error of the same magnitude. The question was then asked whether temperature requirements in sections T4 and N1.3 were excessive. Most Weights and Measures representatives felt that there was no problem with the tolerances for temperature, hence no need to recommend changes to this section of Handbook 44.

Concern was expressed as to whether the 0.15 tolerance for test weight was meaningful without defining the test procedure. It was agreed that FGIS procedures for determining test weight per bushel should be referenced in Handbook 44. It was suggested that the sector recommend that test weight tolerances be removed from the Grain Moisture Meter chapter. There

were objections to removing test weight tolerances in that they are needed for enforcement purposes and for addressing complaints.

### C. Reference method

#### Results of the Meeting

The committee agreed that NCWM should continue to recognize the most current FGIS air oven procedures as the reference method. It is understood that calibrations will need to be updated if FGIS changes air oven procedures. It was recommended that the definition for the air oven reference method be moved from the "Definitions" section of Handbook 44 to section N.1.1 "Transfer Standards" in the Grain Moisture Meter chapter.

### III. Type Evaluation Considerations

#### Results of the Meeting

The discussion of type evaluation procedures did not closely follow the meeting agenda. Rather, broad type evaluation considerations were discussed. It became obvious that a number of issues must be resolved before type evaluation test criteria can be developed for moisture meters. A sub-committee was appointed to address these issues and draft type evaluation test procedures before the next meeting. Members of the sub-committee are: Rich Pierce, Dave Funk, Jim Rampton, Cliff Watson, Jack Barber, and Bob Wittenberger. The topics that needed to be discussed to provide direction for the sub-committee are summarized below.

#### General Approval Approach

Two basic approaches to type evaluation testing of moisture meters were discussed. The first is to evaluate and approve basic instrument capabilities using a calibration that is suitable for type evaluation purposes, but perhaps not adequate for field use in commercial transactions. The second approach is to test both the instrument and the calibration as part of type evaluation, approving the instrument and the calibration for immediate use in commercial transactions. There was disagreement about the more appropriate approach.

Those favoring the first approach felt that "full testing" should not be required as the instrument is approved for additional grain types. They preferred that tests of basic instrument performance, such as susceptibility to radio frequency interference, be conducted only once to approve the instrument, and that a reduced set of tests be conducted to approve calibrations. Calibrations used for type evaluation purposes could be developed using more limited sample sets than would be required for a commercially acceptable calibration. The instrument could be "approved" and calibrations "endorsed" as developed and tested for additional grains. By separating the two testing processes, it would be easier to define what must be done to maintain adequate calibrations. A suggestion that an instrument be "provisionally" approved until suitable calibrations are developed received little support.

Those favoring the first approach also felt that it was unrealistic to expect a new instrument to come in for type evaluation testing equipped with a calibration suitable for commercial use. If devices must be calibrated by the manufacturer prior to being submitted for type evaluation testing, then test tolerances would have to be increased. An associated concern with evaluating both the instrument and the calibration is handling biases between predicted and reference values. It may be necessary to adjust type evaluation data to address bias problems. Furthermore, bias adjustment would not be a problem with NIR analyzers because a validation set could be used to slope and bias individual instruments. A final concern with approving the instrument and calibration was that sometimes the calibration might mask problems with the instrument.

A potential benefit of using a limited sample set to develop a calibration for type evaluation purposes is that the time required to test an instrument may be reduced. However, because of the problems associated with storing high moisture samples, it may not be possible to develop a calibration and conduct type evaluation testing in a single harvest season. Suggestions for addressing this concern were to use a material other than grain for testing, or to use "dry" samples of one type of grain to predict performance with other grains. Neither approach was felt to be feasible.

Those favoring the second approach were concerned about approving an instrument without considering long-term calibration needs. FGIS representatives commented that they have tried approving just the instrument, and that there are problems when type evaluation and calibration are not carefully coordinated. The users or customers do not view the instrument and



calibration separately. They do not understand how an instrument can be approved, yet cannot be used because an approved calibration is not available. A related problem is that of determining criteria for testing or identifying approved calibrations.

The question was raised whether a certificate of conformance should be issued if approved calibrations are not available and the instrument cannot be used in the field. One consideration is the importance of documenting approval activities. The approved instrument and calibration should be clearly specified on the certificate of conformance, along with any auxiliary equipment. The certificate of conformance can then be used to document changes in a calibration. Issuance of a certificate of conformance does not assure permanence or long term approval. It may be desirable for each certificate of conformance to have an expiration date.

Supporters of both approaches seemed to agree that a hierarchical approval process would be required. Specifically, the most feasible approach appears to approve an instrument for use with a few grains and add calibrations and approval for other grains at a later time. One concern with this approach is that not all calibrations stored on an instrument may be approved. This could lead to a problem with sealing instruments if some calibrations on an instrument are approved and others are not.

The committee discussed basic philosophy of experimental design as it relates to type evaluation testing. The comment was made that the test procedures outlined in the FGIS Moisture Handbook approach a full factorial design. An alternative approach is to perform sensitivity analyses and develop test criteria for only those factors affecting moisture results. This approach requires basic knowledge of the instrument technology being tested. It was recommended that the sector ask manufacturers for information on the types of technology most likely to be submitted for testing, then develop general type evaluation tests for these technologies.

#### Instrument Calibration

It was generally agreed that the sector needs to consider calibration requirements for both type evaluation (whether or not this is the calibration to be used in the field) and the long-term. An on-going, long-term calibration effort was viewed as essential if we are to achieve national uniformity in moisture measurement.

There was less agreement regarding how an on-going calibration effort would be maintained. FGIS has the facilities and access to national samples needed to develop these calibrations, but would need to recover the cost of providing calibration data to instrument manufacturers. There was little agreement regarding who should pay for an on-going calibration effort.

The sector felt it reasonable to expect a manufacturer to support calibration efforts for the first few years after a new instrument is introduced because calibration costs could be recovered from the sale of new instruments. Concern was expressed on whether calibration costs could be recovered for instruments already being used in the field. The manufacturer has little leverage to force users to pay for calibration updates. It might cost \$100 to \$500 dollars per user to support calibration development for some older instruments with low sales numbers. This issue was not resolved.

#### Sample Set Selection

There was discussion of assembling a national sample set that could be used for both type evaluation and enforcement by the states, which would ensure that the states are using appropriate field test samples. It would be difficult, if not impossible, to assemble and maintain standard sample sets because high moisture samples will survive for only a couple of months. Furthermore, the availability of high moisture samples may require that all type evaluation testing be conducted during and immediately after harvest.

Concern was expressed that type evaluation testing might not be possible in the off-season or in drought years. It might be possible to characterize a set of stable grains to give the same instrument response as the set we are interested in testing. A similar suggestion was to substitute more stable grain types. These approaches might not work because electrical and surface characteristics are different. There does not appear to be a substitute for using grain with the proper characteristics.

A type evaluation test set should represent a range of varieties, geographic areas, and moisture contents. It was suggested that the sub-committee look at the moisture ranges for samples included in the annual FGIS moisture survey and the moisture ranges specified in Chapter 2 of the FGIS Moisture Handbook to determine realistic moisture ranges for type evaluation and calibration needs. Obtaining high moisture samples at harvest is critical. If type evaluation and on-going calibration efforts are coordinated with the FGIS moisture survey, it will be necessary to obtain larger survey samples.



## Tolerances

The initial question considered by the sector was whether tolerances similar to the acceptance and maintenance tolerances in Handbook 44 would be appropriate for type evaluation purposes. Performance results compiled using data from the annual FGIS moisture survey were distributed. This data indicates that existing moisture meters would be unlikely to meet Handbook 44 tolerances when tested using a randomly selected test set. It was cautioned that Handbook 44 reflected trade expectations and that such expectations often exceed the capability of available technology. It was proposed that statistical tolerances, such as the Normal Root Mean Square of the Difference (NRMSD) as outlined in Chapter 2 of the FGIS Moisture Handbook, be used in type evaluation testing.

Concern was expressed that an instrument might fail simply due to the sample set assembled for type evaluation testing, and that the same instrument might pass with a different test set. This problem might be minimized by eliminating outliers from type evaluation test sets. It was proposed that the Motomco 919 be used as a screening device to preselect samples for use in type evaluation testing. A similar screening process is currently used by state Weights and Measures officials when they select test samples for field verification of moisture meter performance.

Another point of discussion was whether type evaluation approval can be based on instrument performance using a test set consisting of lower moisture samples that would be easier to maintain in good condition. The sector was asked what priority should be placed on high moisture samples. It was estimated that as much as 80% of the corn crop is dried to a moisture content of 18% or less before marketing.

The sector discussed type evaluation testing over a range of operating temperatures. Handbook 44 currently specifies that a moisture meter will operate over a temperature range of 2 °C - 40 °C (35 °F - 104 °F), or the temperature range specified by manufacturer if that temperature range is not applicable. Interest was expressed in establishing a standard temperature range for type evaluation testing. This would facilitate testing of more than one instrument at a time during the environmental phase of type evaluation testing. A standard test range of 10 °C - 40 °C (50 °F - 104 °F) was suggested. There was no discussion of testing instruments over a range of relative humidities.

A final point of discussion was whether it was desirable to test the effect of Radio Frequency Interference (RFI) on instrument performance. Henry Oppermann cautioned that, if we are going to require RFI testing, it would be necessary to test over the entire spectrum of frequencies. The sector will have to determine how much of a problem RFI presents and weigh the costs and benefits of testing for susceptibility to RFI. Instruments are currently being tested to determine if they generate RFI that interferes with other applications, but not to see if they are susceptible to RFI. One suggestion was to require that instruments be tested by an independent laboratory that would certify that they are not susceptible to RFI.

## Sealing Instruments Adjustments

Some sector members were troubled that NIR instruments are unique and require individual slope and bias adjustment. They were concerned that the operator needs to make frequent bias adjustments hence the sector may need to consider that NIR analyzers might not be suitable for commercial use as moisture meters. Devices are already available that do not require a daily bias check. As an alternative, the sector may need to investigate other means of establishing checks and balances, such as requiring certification and licensing of NIR operators. There are more safeguards available in other areas regulated by Weights and Measures.

The performance of NIR analyzers was defended, and it was noted that they work very well in Canada for determining moisture. However, only six to eight well-centralized companies measure grain moisture in Canada. These companies have strong quality control programs, and their operation is similar to that in a regulated environment. Some sector members felt that it was inappropriate to exclude NIR analyzers, but putting a quality control system in place could ensure reliable results. A final comment was that it is inconsistent to consider NIR analyzers unsuitable for use as moisture meters, but all right to use them for determining wheat protein.

**Participants**  
December 17-18, 1991

Name	Organization
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John Barber . . . . .	Dickey-john Corp.
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## Meeting Summary

National Type Evaluation Technical Committee  
NIR Wheat Protein Analyzer Sector  
December 19-20, 1991

The agenda for the two day meeting is listed below.

- I. Goals and scope of the Committee
- II. Overview of NIR technology and FGIS programs
- III. Handbook 44 Code
  - A. Handbook 44 code needs to be developed for NIR wheat protein analyzers.
  - B. Measurement Technologies to be Considered by the Committee
  - C. Reference Method for Determining Wheat Protein
- VI. Type Evaluation Considerations
  - A. Calibrations
    - 1. Calibrations used for type evaluation testing
    - 2. Wheat classes
    - 3. Grinder specifications
  - B. Test Procedures and Tolerances
    - 1. Accuracy, repeatability, and reproducibility
    - 2. Environmental tests
  - C. Sample Selection and Preparation

## RESULTS AND DISCUSSION

## I. Goals and scope of the Committee

Because all members of the NIR Wheat Protein Sector are also members of the Moisture Meter Sector, there was no additional discussion of the goals and scope of the sector. Refer to the summary of the Moisture Meter Sector meeting for comments relating to the goals and scope of the two sectors.

## II. Overview of NIR technology and FGIS programs

Results of the Meeting

Committee members were provided with background information on (1) basic operating principles for NIR protein analyzers, (2) reference methods for determining wheat protein, (3) FGIS monitoring procedures for official wheat protein determination, and (4) FGIS type evaluation test procedures. The overviews effectively provided background information to committee members, and provided an opportunity for those individuals familiar with NIR instruments to share observations on basic operating principles.

Discussion

NIR Overview. Dave Funk, FGIS, presented operating characteristics for two basic types of NIR technology: Reflectance-type instruments that usually are fixed filter instruments operating at wavelengths between 1068 to 2575 nm, and transmittance-type instruments that utilize wavelengths in the very near-infrared region from 800 to 1100 nm. Reflectance-type instruments typically obtain readings from the light reflected from the surface of a ground grain sample. Multilinear regression is the most common calibration technique used with these instruments. Transmittance-type instruments typically measure the amount of light transmitted through a whole grain sample.

One concern expressed following this presentation was the need to standardize acronyms used to describe these instrument types, i.e., NI, NIR, NIRS, NIRN, NIRT, or NIT.

Reference Method. Bill Burden, FGIS, discussed kjeldahl and other procedures used to determine protein content. FGIS plans to adopt a combustion-type nitrogen analyzer for use as an approved protein reference method were discussed. Use of a combustion-type nitrogen analyzer should allow more samples to be analyzed in a shorter period. This is important because NTEP type evaluation and calibration activities would represent added load on an operation that is already a bottleneck in FGIS protein operations. It was commented that individual states may want to use kjeldahl facilities currently available in their states to establish protein values for standard field check samples.

FGIS Wheat Protein Program. Dave Funk, FGIS, outlined FGIS procedures for maintaining a wheat protein program within the official inspection system. This effort includes instrument calibration, maintaining slope and standard reference sample sets, and monitoring the performance of instruments in the field. FGIS receives nation-wide monitoring samples and can assemble a pool of samples to be used for type evaluation or calibration purposes. FGIS NIR calibrations are developed using protein values adjusted to a constant moisture basis of 12% wet basis (w.b.). Slope adjustment is a procedure used to transfer universal calibrations to different instruments of a given model. Slope adjustments are infrequent, typically not required more than once or twice a year. Bias adjustments with standard reference samples are more frequent, with bias checks required daily. Thus, NIR instruments typically require frequent checks; checking only once a year probably is not realistic since there can be significant changes in bias over that period.

FGIS Type Evaluation. Rich Pierce, FGIS, presented an overview of FGIS design criteria, performance specifications, and test protocol for NIR wheat protein. Discussion focussed on test procedures outlined in the document "Design Criteria and Operational Performance Specifications for Grain Constituent Measuring Instruments Using Near Infrared Spectroscopy."

The question of having to submit NIR instruments for both wheat protein and grain moisture type evaluation testing was discussed. Reasons given for conducting these tests separately included: (1) test sample sets may not be the same for both type evaluation tests, (2) high moisture samples need to be handled differently than the lower moisture, more stable samples suitable for use in testing wheat protein determination, and (3) desirable grinder characteristics for use with reflectance-type instruments, such as minimizing moisture loss and the fineness of grind, are different for moisture and protein analyses. A uniform, fine particle grind is required for protein analyses while a coarser grind may be acceptable when making moisture determinations.

FGIS uses the Udy cyclone grinder to prepare samples for protein analyses, and uses the Wiley Mill when a whole grain moisture determination is required and moisture loss during grinding needs to be minimized. The Wiley Mill typically provides a coarser ground product than the Udy grinder.

### III. Handbook 44 Code

- A. Handbook 44 code needs to be developed for NIR wheat protein analyzers.

#### Results of the Meeting

The committee agreed that the Grain Moisture Meter code should serve as a guide for developing NIR wheat protein analyzer code. The committee recognized that the use of metric units is required for Handbook 44 code. It was recommended that the code specify that protein values be corrected to a constant moisture basis of 12% w.b.. Rich Pierce and OWM personnel will draft NIR Wheat Protein code for Handbook 44.

The committee agreed to adopt ten design requirements (with appropriate revision) used by FGIS in previous type evaluation testing. The specific items adopted by the committee are listed below with discussion of recommended changes. The committee recommended against adopting requirements that FGIS personnel be able to develop calibrations on approved instruments, that minimum calibration capacity be four products and three constituents each, that the instrument be equipped with FGIS specified optical filters, and that the minimum analysis time be five minutes.

#### Discussion

The committee discussed reporting wheat protein on either the 12% moisture basis used by FGIS, the 13.5% moisture basis used in Canada, on a dry basis moisture content, or on an "as is" moisture basis. To promote uniformity, it was decided that protein values should be reported on the 12% moisture basis used by FGIS. Handbook 44 code should include a user requirement that wheat protein be displayed only on a 12% moisture basis. The moisture basis used to report protein level should be listed on the printed statement, if available, or on the hand written ticket.

Concern was expressed whether the consumer (farmer) would believe the corrected protein value unless the moisture content also is displayed. This issue was not resolved.

The committee discussed design criteria previously used by FGIS, agreeing that the following items should be included in either Handbook 44 or Publication 14.

1. The manufacturer shall provide the model(s) identification, applicable drawings, and data indicating the equipment potentially meets performance specifications. This does not require that detailed schematics of electronic circuits be submitted unless required to definitively define the model. Requirements regarding the materials to accompany the request for type evaluation will be addressed in Publication 14.

2. Handbook 44 code should state that calibrations must be transferable between different instruments of a given model type.

Comments: Allowable techniques for transferring calibrations must be specified. Slope and bias adjustments are considered normal calibration transfer procedures.

3. Handbook 44 code shall include a requirement that the operator be able to load and verify calibration constants and standardize the instrument on location without use of an auxiliary computer. An external computer used for normal constituent analysis is not considered auxiliary.

Comments: The operator's ability to change calibration constants may contribute to the facilitation of fraud. It was correctly noted that calibration constants cannot be verified on some instrument types.

4. Handbook 44 code should specify that instruments have a built-in standard serial port, such as an RS 232 port, capable of providing output of constituent contents and data required for calibration development.

Comments: This feature is needed to collect calibration data and is also a desirable feature for day-to-day data collection. Handbook 44 code should specify use of a "standard serial port" instead of requiring an RS 232. It was pointed out that RS 442 or RS 449 ports are better suited for some uses, i.e., a high noise environment, than an RS 232 port. It should be required that the output be compatible with that of an RS 232, and stated that BCD or HP-IB output is not acceptable.

Serial ports are used in instrument development and production and most instrument models are equipped with serial ports, so this requirement should not be difficult to meet. It is anticipated that as inspection systems become more sophisticated, information will be routinely downloaded to remote computers.

5. Handbook 44 code should require that instruments be capable of programming to display constituent contents of products in percent on a constant moisture basis. The display shall permit constituent value determination to 0.01 and 0.1 percent resolution.

Comments: It was discussed that the 0.01 percent resolution is required for use in type evaluation testing, and that the 0.1 resolution is typically used in the field. The consensus was to keep this specification, but to clarify the reason for requiring two different display resolution values. This requirement is consistent with General Code requirements on rounding.

It was suggested that requirements for size and visibility of displayed values should be defined. This concern appears to be adequately covered in the General Code. It was suggested that we might want to require a printout of pertinent information such as date, product, and protein level.

6. Handbook 44 shall require that an instrument operate on AC power and that performance requirements shall be met with line voltage variations from 100 to 130 volts at 59.5 to 60.5 cycles per second.

Comments: It was suggested that the cycles per second range not be specified in Handbook 44. There is a similar requirement in the Scales Code, but the effect of varying cycles per second is typically not tested. The response was that this requirement should be in Handbook 44, even if it would typically not be tested during type evaluation, so that a device can be rejected if a problem exists. It was felt that this approach could be explained to the Specifications and Tolerances Committee.



7. FGIS requirements state that the instrument shall attain hardware accuracy within 24 hours of power turn-on from a cold start.

Comments: It was felt that the 24-hour warm-up time is excessive and that the precedent in the Scales Code is that a device should not indicate a result until it can perform within specified requirements. Typically, this requires a sensor to detect when the instrument is ready to analyze. It is not trivial to design this into an instrument. Concern was expressed that an instrument may lock up due to a power glitch or after being unplugged and moved across the room. A suggestion that manufacturers could incorporate an UPS system met with concerns about expense. A similar problem is addressed in Sections T.5 and TN.814 of the Scales Code. The consensus was that requirements for warm-up time should be written using language already developed in other Handbook 44 chapters.

8. Handbook 44 should include a requirement that instrument optics and electronics be protected from exposure to dust by either sealing both areas or by protecting them with a dust filtration system suitable for the removal of air-borne grain dust. Instruments with dust filter systems should not overheat at 50% blockage of the filter within the operating temperature range. Dust filters shall be easily replaced.
9. FGIS requirements state "If an instrument has an upper internal operating temperature limit that could be exceeded within an ambient temperature range of 10 °C to 32 °C (50 °F to 90 °F), then a means of sensing and indicating an over-temperature condition must be provided."

Comments: This requirement needs to be reworded and included with requirements for warm-up time. Again, a similar requirement is addressed in Section T.5 of the Scales Code.

10. Handbook 44 should specify that if an instrument must be positioned to less than 3 degrees from an upright normal position to a level plane in order to meet performance specifications, then the instrument shall have a level indicator and leveling adjustments.

Comments: This requirement should be included because some monochromater devices might be sensitive to operation in out of level conditions.

The committee decided not to include requirements for permanence or life testing in the NIR chapter, feeling that this area is adequately covered in Section G-S.3 in the General Code. Procedures for testing permanence should be included in Publication 14. FGIS test criteria include a requirement of 8,000 continuous measurements without failure, that was intended to reflect 1 year of operation in their system. FGIS has waived permanence testing in the past, and required justification from the manufacturer that their instrument meets permanence requirements. It was commented that 8,000 measurements is not a very challenging test.

#### B. Measurement Technologies to be Considered by the Committee

#### Results of the Meeting

It was agreed that the code for protein analyzers should be limited to near-infrared reflectance- and transmittance-type instruments. These instruments may utilize either whole grain or ground grain samples.

#### Discussion

We are limiting technology to near-infrared analyzers since by definition we are developing test criteria for NIR wheat protein analyzers. It was recommended that the code be general enough to accommodate future type evaluation of NIR instruments used to test other commodities and constituents such as soybean protein and oil.

#### C. Reference Method for Determining Wheat Protein

#### Results of the Meeting

The code will require use of a reference method recognized by FGIS. FGIS will develop the wording to be used in the code.

### Discussion

The committee discussed the fact that FGIS is moving toward recognition and use of a combustion-type nitrogen analyzer as a primary reference method. Some states may want to use kjeldahl to establish field standards for enforcement; this may require a round-robin sample exchange program to ensure agreement between kjeldahl and combustion-type nitrogen analyzer results.

## **IV. Type Evaluation Considerations**

- A. Calibrations
  - 1. Calibrations used for type evaluation testing
  - 2. Wheat classes
  - 3. Grinder specifications

### Results of the Meeting

The committee agreed that calibrations used for type evaluation testing may be either supplied by the manufacturer or developed as part of type evaluation. The calibration used during type evaluation testing shall be specified on the Certificate of Conformance, and its use will be required for instruments used in commercial inspection. An on-going calibration effort is required for NIR wheat protein analyzers; a national calibration set is needed.

Instruments (and calibrations) must be evaluated for each individual class of wheat for which approval is requested. This does not mandate the use of separate calibrations for each wheat class. Instruments may be submitted for evaluation using an all-class calibration that will be tested for each class individually using a single slope and bias adjustment. Instruments using all-class calibrations must conform to the same test requirements as those using calibrations for individual classes of wheat. The classes of wheat for which an instrument is approved will be specified on the Certificate of Conformance.

The make and model of grinder used when developing calibrations for ground-grain NIR protein analyzers must be specified by the manufacturer, and listed on the Certificate of Conformance as required auxiliary equipment.

### Discussion

The committee discussed two means of obtaining calibrations suitable for use in type evaluation testing. One option is to use a calibration provided by the manufacturer. If calibrations are provided by the manufacturer, a standard set of slope samples may be required so that appropriate slope and bias adjustments can be made to accommodate type evaluation testing with a national test sample set. Having the manufacturer provide calibrations may not be a reasonable requirement for new instruments with no calibration history.

The second option is to develop calibrations as part of type evaluation testing. FGIS has tested NIR analyzers using calibrations developed specifically for type evaluation testing and based upon 50 samples selected from the same population as the test set. This approach is not recommended for NTEP evaluations because calibrations based upon only 50 samples are probably not adequate for field use. A national calibration set is needed to promote uniformity in wheat protein measurements.

A national calibration set could be used to develop calibrations suitable for both type evaluation and commercial protein determinations, requiring that 150-200 calibration samples be assembled for each class of wheat. The NTEP laboratory would supply the manufacturer/applicant with log and chemical data for these calibration samples, and for an additional 50 samples included in a validation set. It would then be the manufacturer's responsibility to use this data to develop a calibration that meets all type evaluation test requirements. With this approach, there would be no need to specify minimum requirements for the Standard Error of Calibration (SEC). This approach should promote uniformity since field results would be based upon calibrations developed using a standard calibration set.

The committee discussed how to handle situations where instruments are resubmitted for testing after having previously failed to meet type evaluation test criteria. Normally, the manufacturer must address problems identified during type evaluation before resubmitting the instrument for another evaluation. It was suggested that we allow an instrument to be resubmitted for type evaluation if the calibration is modified and improved. There was some concern that an instrument might fail due to the test set used for evaluation. Testing should clearly demonstrate that an instrument has a tendency to fail.

The grinder and the characteristics of the ground sample have a significant effect on calibration performance. Changing the grinder invalidates the calibration and requires that the instrument be reevaluated. This presents a dilemma for NIR manufacturers in that the approval of an instrument depends upon continued availability of the specified grinder. The NTEP laboratory should have the option of requiring the manufacturer to provide a grinder to be used in type evaluation testing. The question of durability and permitted wear on the grinder was also discussed.

B. Test Procedures and Tolerances

1. Accuracy, repeatability, and reproducibility
2. Environmental tests

**Results of Meeting**

The committee agreed that type evaluation criteria previously used by FGIS should be revised to form the initial draft of NTEP test criteria. Test criteria and tolerances developed by FGIS for instrument accuracy, repeatability, reproducibility, and susceptibility to environmental conditions are described in the document "Design Criteria and Operational Performance Specifications for Grain Constituent Measuring Instruments Using Near Infrared Spectroscopy."

**Discussion**

It was suggested that the order of testing be such that it is possible to check fatal errors first. Type evaluation testing would stop at the first failure. It was recommended that instrument precision be tested first as a good check on the suitability of the calibration.

The tolerances established by FGIS were intended to define state-of-the-art equipment. The committee was asked if it was reasonable to expect this kind of performance from commercial grain inspection equipment. The committee felt it was acceptable for type evaluation tolerances to be tighter than what can be maintained in the field. Several instruments have already met these requirements, and it would be a move backward to widen tolerances.

Requirements for some environmental tests are severe, and different tolerances might be needed for instruments operated outside the "normal" range of parameters. The committee felt that all environmental tests should be retained, but that tolerances should be reexamined. The tolerances are a particular concern for instruments that cannot accommodate the use of sealed samples.

Tolerances for field enforcement were discussed briefly. Handbook 44 tolerances should be related to the statistical tests used for type evaluation. It is important that the grain industry understand the variability and limitations associated with wheat protein determinations.

The need for an on-going quality assurance program to maintain field performance was discussed. The availability of field test samples and standard reference samples (for regular bias checks) are a concern. States could assemble test samples and submit a portion of each to FGIS for analysis. In this way, FGIS laboratories can be used to standardize the protein values of samples used for regulation. The states may in turn provide reference samples to elevators. Such efforts will complement an on-going calibration program.

C. Sample Selection and Preparation

**Results of Meeting**

The committee agreed that type evaluation test sets should be selected to cover appropriate ranges of growing conditions (geographic location) moisture content, protein, and hardness level for each wheat class. The rules for selecting test samples need to be consistent. This is important because it will not be possible to use the same test set for an extended period. It also will be desirable to use a different test set in the event an instrument is reevaluated.

V. Next Meeting

Issues identified for discussion at the next meeting are:

1. How will on-going calibration efforts be funded? This is a concern for both moisture meters and NIR wheat protein analyzers.

## 2. Will NTEP testing be waived for instruments currently approved by FGIS?

The meeting adjourned at noon Friday, December 20. Several committee members toured the FGIS Technical Center in the afternoon.

## Participants

December 19-20, 1991

Name	Organization
John Antoniszyn . . . . .	Canadian Grain Commission
Cathy Brenner . . . . .	USDA/FGIS
Bill Burden . . . . .	USDA/FGIS
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Dave Funk . . . . .	USDA/FGIS
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Henry Oppermann . . . . .	NIST
Rich Pierce . . . . .	USDA/FGIS
Robert Rachlis . . . . .	Bran + Luebbe Inc.
Joseph Rothleder . . . . .	California Div of Measurement Standards
Cheryl Tew . . . . .	North Carolina Dept of Agriculture
Cliff Watson . . . . .	Consultant
Phil Williams . . . . .	Canadian Grain Commission
Robert Wittenberger . . . . .	Missouri Weights and Measures
Richard Wotthlie . . . . .	Maryland Weights and Measures

## Meeting Summary

### Subcommittee of the NTETC Moisture Meter Sector March 18-19, 1992

#### Attendees

- |                             |                                   |
|-----------------------------|-----------------------------------|
| 1. Jack Barber, Dickey-john | 5. Jim Rampton, FGIS              |
| 2. Dave Funk, FGIS          | 6. Hugh Shown, Dickey-john        |
| 3. Henry Oppermann, NIST    | 7. Cliff Watson, Consultant       |
| 4. Rich Pierce, FGIS        | 8. Bob Wittenberger, Missouri W&M |

#### Goals of the Meeting

The purpose of this meeting was to outline type evaluation tests and tolerances for use in developing a moisture meter section in Publication 14.

#### Results of the Meeting

- A. The subcommittee reviewed moisture meter test requirements specified in the FGIS Moisture Handbook, OIML International Recommendation No. 59 "Moisture Meters for Cereal Grains and Oilseeds," and the NCWM Handbook 44 to determine which tests should be included as part of an NTEP type evaluation.
- B. The subcommittee discussed the overall evaluation process and general approval requirements.
- C. The subcommittee outlined specific procedures for several tests, and suggested approaches for defining procedures for the remaining tests.
- D. The subcommittee identified issues that need to be addressed by the Moisture Meter Sector.

#### Discussion

Subcommittee members were provided copies of Attachments 1, 2 and 3 at the meeting. Attachment 1 outlines the topics to be included in Publication 14, and illustrates how development of type evaluation test procedures fit into the overall development process. Attachments 2 and 3 list tests that need to be considered in developing type evaluation test criteria. Discussion is summarized into the four general categories listed above.

Concern was again expressed that it is difficult to develop test criteria if there are no limits placed on the types of measurement technologies that may be evaluated. The subcommittee listed dielectric (capacitance), conductance (resistance), near-infrared spectroscopy, microwave transmission, thermogravimetric (moisture balance), and nuclear magnetic resonance (NMR) as possible measurement technologies. It was agreed that both line and battery power sources might be used. The subcommittee was reminded that the technologies to be evaluated will not be limited by design criteria in Handbook 44, but may be eliminated if they can not meet performance specifications.

#### A. Type Evaluation Tests

The subcommittee recommended that type evaluation testing verify the effects of fluctuations in power supply, power interruptions, storage temperature, temperature cycling, leveling, endurance (life test), warm-up time, operating temperature, differences between instrument and sample temperature, humidity, and instrument accuracy, precision, and reproducibility. Tests for vibration, radio frequency interference, stabilized readout, impurity (dockage) levels, external magnetic fields, electro-magnetic radiation, and failure of the power supply were not recommended for type evaluation. Comments on these tests are summarized below; a notation is provided for each item to indicate whether or not it is included in the checklist.

- 1. Power Supply (include) - It was agreed that this test should be included because power supply requirements are addressed in Handbook 44. The subcommittee recommends that performance be tested over a range of voltages (100 - 130 volts) while operating at a nominal frequency of 60 Hz. This nominal frequency should be used throughout type evaluation testing.



2. Vibration (do not include) - Henry Oppermann commented that NTEP evaluations for other types of equipment do not include vibration tests. It was noted that vibration problems during shipping are normally a reliability problem. Before on-site vibrations become a problem it is generally necessary that they be at a resonance frequency. This makes it difficult to design a test to demonstrate that a vibration problem exists.
3. Storage Temperature and Temperature Cycling (include) - This test is associated with conditions that might be encountered while an instrument is being shipped. Storage temperature tests should expose problems associated with adjoining parts having different coefficients of thermal expansion. It was suggested that these problems would be more readily apparent if the temperature was cycled. Storage temperature/temperature cycling tests will be conducted while the instrument power is off. It was noted that storage temperature is not referenced in Handbook 44 and that it will be necessary to either revise Handbook 44 to include storage temperature or to interpret some other section of Handbook 44 (permanence?) to cover storage temperature/temperature cycling tests.
4. Radio Frequency Interference (do not include) - Henry Oppermann indicated that this test is not required for other types of equipment tested by NTEP, and that the metal walls in their lab were not suitable for RFI testing. It was noted that RFI testing requires a lot of work and that testing might not address or identify actual problems.
5. Leveling (include) - This test should be required because grain might flow differently through instruments that are not level.
6. Life Test (include) - It was noted that stability might be a more important long-term test than permanence. It was unclear whether life testing should reflect the volume of samples run, a specific time period, or both.
7. Warm-up Time (include) - Warm-up time tests should be included because they are addressed in Handbook 44 specifications.
8. Stabilized readout (do not include)
9. Display Resolution - Display resolution is addressed in Handbook 44 and must be verified, but is more appropriately included as part of the checklist.
10. Moisture Ranges - Moisture ranges are related to the calibration and should be reported accordingly. The moisture range needs to be specified on the Certificate of Conformance. The problem is in verifying the moisture range over which instrument and calibration performance should be approved.
11. Accuracy, precision (repeatability) and reproducibility all describe instrument performance and should be included as part of type evaluation testing. These terms need to be defined, both in descriptive and mathematical terms. Jack Barber commented that the Normalized Root Mean Square of the Difference (NRMSD) described in Chapter 2 of the FGIS Moisture Handbook does not provide information on how well moisture is predicted over specific moisture ranges, and that a better measure than NRMSD is needed to describe instrument and calibration accuracy. There also is a need for a meaningful measure that can be used to determine when calibrations need to be updated. Tolerances used in type evaluation testing need to be tight enough to ensure that meters meeting type evaluation criteria also meet Handbook 44 requirements. Tests for instrument reproducibility are not covered by Handbook 44 requirements.
12. Auxiliary Equipment (do not include) - There was considerable discussion regarding test criteria and tolerances for test weight apparatuses. It is obvious that state Weights and Measures officials need approval criteria for test weight kettles. However, development of such criteria is not the responsibility of the sector.
13. Impurities (do not include) - The effect of impurities (broken grain and fine material) in the grain sample is difficult to define in a meaningful way. It is included in OIML requirements primarily because of concerns with measurements on high moisture grain. A statement indicating that tests will be conducted with clean grain needs to be added to Publication 14. User requirements may need to address the effect of impurities on instrument performance. It was felt that dockage levels of 5 percent or less probably will not affect moisture results.
14. Humidity (include) - Humidity tests should be included because humidity level might have a considerable affect upon the performance of thermogravimetric devices, and may have some affect upon resistance meters. Henry had

reservations about including humidity tests, and noted that scales are not tested over a range of humidities. It was suggested that humidity tests could be adapted from A.3.2 Damp Heat, Steady State.

15. External magnetic fields and electro-magnetic radiation (do not include) - The reason for not including these tests is similar to that given for electromagnetic susceptibility. These problems are difficult to detect and there is no guarantee that a test can be developed that would reliably identify instrument weaknesses.
16. Electrostatic discharges (do not include) - These effects are random. We are not sure what the effect will be.
17. Failure of the electrical power supply (do not include) - The general feeling was that problems associated with a power failure or brownout are obvious to the user through error codes or instrument failure. There is no need to type evaluate features that are obvious in the field.

The subcommittee discussed the associated problem of automatically detecting a corruption in the calibration. This is a concern where calibration data is stored as bits of data. Most subcommittee members agreed that detection of calibration corruption needs to be designed into the instrument as an automatic check instead of having to manually check calibration codes. Cliff Watson felt that printing out the calibration constants is an acceptable alternative. It was recommended that Handbook 44 code be developed specifying automatic checks for calibration corruption.

#### B. Overall Evaluation Process

A concern voiced at the December sector meeting was that "full-blown" type evaluation testing should not be required to extend approval to additional grain types or update calibrations. It was clarified that there is no need to perform redundant tests, and that only new features or performance ranges need to be tested. Type evaluation should not be required for calibration updates performed as part of the on-going calibration effort.

The subcommittee recommended that type evaluation testing be conducted in two phases. The first phase would emphasize tests more directly related to instrument performance, and would be conducted using grain samples representing a limited moisture range. Limiting moisture ranges will allow these tests to be conducted nearly year-round. The second phase of testing will be designed to extend approved moisture ranges for the calibration and will be conducted during harvest when higher moisture samples are available.

The manufacturer will be responsible for supplying instruments equipped with calibrations capable of meeting phase one test requirements. They also must provide data showing that the calibration is based on real grain samples representing their reported operating range.

#### C. Specific Test Procedures

Basic phase one testing will be conducted by running all tests on each of two instruments. Most tests will be conducted at room temperature (room temperature conditions need to be defined). The subcommittee agreed that many of the test can be conducted using Hard Red Winter (HRW) wheat or the most uniform applicable grain. The following test procedures were outlined for power supply, storage temperature and leveling tests.

<u>Test</u>	<u>Grain Type</u>	<u>Moisture Range</u>	<u>No. of Samples</u>	<u>Tolerance</u>	<u>Test Range</u>
Power-Line	HRW	12-14	1 sample, 10 drops	0.2 x accept tol. (also precision)	100-130 v 200-250 v
Battery	HRW	12-14	1 sample, 10 drops	0.2 x accept tol. (also precision)	Max Volt. No result
Storage Temp	HRW	12-14	1 sample 10 drops	0.4 x accept tol.	-20 to 55 °C
Leveling	HRW	12-14	1 sample	0.2 x accept tol.	H-44 spec

## Notes:

Power supply - A total of 30 drops will be required, 10 at the nominal voltage of 117 V, and 10 drops each at the voltage extremes. The lower voltage limit for a battery powered instrument will be the point at which a result is no longer provided.

Storage Temperature - Drop the sample 10 times at room temperature and relative humidity prior to temperature cycling. Turn the instrument off. Increase the temperature to 55 °C over a 1 hour period. Maintain the temperature at 55 °C for 3 hours. Decrease the temperature to -20 °C over a 1 hour period. Maintain the temperature at -20 °C for 3 hours. Repeat the cycle. Turn the instrument on for the specified warm-up period and drop the test sample 10 times.

Leveling - The leveling test will be conducted for a minimum of 2 orientations; front-to-back and left-to-right. Additional orientations will be tested as deemed appropriate.

Due to time constraints, the subcommittee moved to discussion of accuracy, precision and reproducibility tests instead of continuing to outline procedures for the more basic tests. The discussion dealt primarily with identifying an approach for developing test criteria. General recommendations include:

1. In addition to testing for accuracy over the moisture range, instrument accuracy should be evaluated for each 2% moisture interval.
2. FGIS data for the Motomco 919 will be used to determine the number of samples per 2% interval, the number of drops per sample (probably 3), and the tolerance limits that will be applied.
3. Tolerances will reflect a confidence interval, determined using FGIS data, applied to the maximum allowable instrument bias. Confidence intervals will be developed for individual grain types and classes.
4. Accuracy tolerances should be established for both the average moisture for samples in a 2% interval and for the Standard Deviation of the Differences (SDD) for all samples in an interval.

Jack Barber asked whether it was necessary to evaluate instrument precision for every grain type, or whether testing could be done using a limited number of grain types. He suggested oats (low test weight), sunflowers (conductivity), soybeans (uniformity), corn, and wheat. It may be possible to collect all the data needed for precision testing at the same time that accuracy testing is being performed. This item was not resolved.

#### D. Additional Issues and Action Items

Jack Barber noted that the State of California lists calibration constants on the Certificate of Conformance they issue for moisture meters. It was recommended that calibration constants be listed on NTEP certificates.

The sector needs to develop criteria for determining when a calibration needs to be updated.

There needs to be a procedure to phase out instruments if calibrations are not being maintained by the manufacturer. This is a particular concern if instrument users are bearing the cost of collecting calibration data.

Handbook 44 code should require that only the most recent calibration be available to the operator. Inspectors should destroy old calibration charts or disk.

ATTACHMENT 1

PUBLICATION 14 - ADMINISTRATIVE PROCEDURES, TECHNICAL POLICY,  
CHECKLISTS, AND TEST PROCEDURES

I. Application Form

Standard application form specifying the information and performance data to be supplied by the manufacturer when applying for type evaluation.

II. Evaluation Process

Overview of application procedure, performance testing that will be required, procedure for assembling sample sets, and performance tolerances.

III. Certificate of Conformance

Applications (grain types, moisture ranges, temperature ranges, etc.), Requirements for Use (approved calibration, auxiliary equipment, etc.), and Post-Evaluation Responsibility of the Manufacturer (i.e., on-going calibration development and updates, inform NCWM of any changes in the instrument).

IV. Checklist of Design Features

Verify that the instrument meets design specifications in Handbook 44 code.

V. Test Procedures

Detailed test procedures for performance tests. Format for reporting test results.

NOTE: A type with a valid Certificate of Conformance may be reevaluated in order to encompass additional features, such as the range of the measured quantity or the kinds of commodities that may be measured.

In most such cases, it will be sufficient to determine the validity of the added features: the evaluation(s) will not go through the entire checklist, but will test the new features through their ranges of performance.

## ATTACHMENT 2

## TYPE EVALUATION REQUIREMENTS

**FGIS Moisture Handbook - Chapter 2. Performance Requirements**

- A. Power Supply
- B. Vibration
- C. Storage Temperature
- D. Electromagnetic Susceptibility
- E. Leveling
- F. Life Test
- G. Hardware Performance
  - 1. Accuracy
  - 2. Warm-up Time
  - 3. Stabilized Readout
  - 4. Display Resolution
- H. Operational Performance
  - 1. Accuracy and Allowable Quality Limits
  - 2. Reproducibility
  - 3. Precision
- I. Sample Preparation Equipment (Auxiliary Equipment)

**OIML Rec. No. 59 - Moisture Meters for Cereal Grains and Oilseeds**

- A. Test for conformity with design requirements
- B. Accuracy tests under reference conditions
- C. Tests including the various influence quantities
  - 1. Temperature Variations
  - 2. Impurities
  - 3. Voltage (possibly frequency)  
Humidity
- D. Influence of external disturbances
  - 1. External magnetic fields  
Electro-magnetic radiations  
Electrostatic discharges  
Failure of the electrical power supply



## MEETING SUMMARY

**National Type Evaluation Technical Committee  
Moisture Meter Sector  
and  
NIR Wheat Protein Analyzer Sector  
June 10-12, 1992**

The agenda for the meeting is listed below.

- I. Goals for the Moisture Meter Sector
- II. Handbook 44 Code
  - A. Specifications and Tolerances Committee Item 360-5
  - B. Minimum sample size
  - C. Design specifications to reduce facilitation of fraud
  - D. Acceptance tolerances
  - E. Calibration verification
- III. Type Evaluation Criteria (Publication 14)
  - A. Evaluation process
    - 1. Application requirements
    - 2. Two-phase evaluation process
    - 3. National calibration program
  - B. Checklist for compliance with Handbook 44 Code
  - C. Test procedures and tolerances
    - 1. Basic instrument tests
    - 2. Accuracy, precision, and reproducibility tests
- IV. Funding for the National Calibration Program
  - A. Calibration requirements for type evaluation approval
  - B. Funding long-term calibration support
- V. Status of Equipment Currently Approved by the States and by FGIS
  - A. Models approved by the states
  - B. Models approved by FGIS
- VI. Scheduling Future Meetings
- VII. Additional Issues Requiring Discussion

In addition to the items listed above, the group reviewed part of the Handbook 44 chapter drafted for Near-Infrared Grain Analyzers. This review resulted in additional recommendations for changes to the Grain Moisture Meter chapter. These recommendations are presented below following discussion of Handbook 44 Code considerations for grain moisture meters.

## RESULTS AND DISCUSSION

### I. Goals for the Moisture Meter Sector

The goals of the committee were identified as follows:

This committee has responsibility for developing detailed test criteria for type evaluation testing of moisture meters. Interpretation of Handbook 44 code and type evaluation test procedures developed by this committee will be incorporated into Publication 14. Type evaluation test procedures must be supported by code in Handbook 44.

### II. Handbook 44 Code Considerations

- B. Minimum sample size

## Results of the Meeting

Sector members agreed that a minimum sample size should be specified for moisture meters. The minimum sample size will be 100 g, 400 kernels or seeds, or the volume equivalent, whichever is smallest.

## Discussion

There was some discussion that this requirement might not be needed. It was suggested that we let the manufacturer specify the sample size, then test to see if an instrument meets type evaluation requirements using that size of sample. This raised concerns that it would then be necessary to prepare non-homogeneous test samples to test whether the sample size was adequate. These samples would be inherently unstable and difficult to characterize. Concern was also expressed that some single kernel moisture testers could be set to provide a moisture result based upon analysis of a single kernel. The group agreed that a minimum sample size should be specified.

It was suggested that the recommendation for a minimum sample size be changed from 150 g to 100 g because some Motomco charts currently specify the use of a 100 g sample. The volume and kernel equivalents were suggested to accommodate low test weight grain and grains with small seeds, respectively. It was initially suggested that we put a requirement in Handbook 44 specifying a minimum sample size of 100 g or the equivalent, then specify in Publication 14 what we mean by "equivalent." This would force non-NTEP states to make their own interpretations of equivalence in enforcing Handbook 44 requirements. It was suggested that minimum sample size be included in Handbook 44 as a user requirement, again, creating problems for non-NTEP states trying to interpret Handbook 44. There was a recommendation that reference equivalence charts be developed.

It was asked whether specifying a minimum samples size implies that an instrument should not provide a reading when the sample size is below the specified minimum. The question was expanded to include existing meters, i.e., Should the Motomco 919 provide a reading on a 249 g sample? The committee agreed that the intent of the minimum sample size requirement was not to preclude a meter from indicating a result if the sample size is less than the specified minimum. The minimum sample size is a design requirement that should be verified as part of type evaluation. Ensuring that the appropriate size sample is used in the instrument is the responsibility of the user.

### C. Design specifications to reduce facilitation of fraud

## Results of the Meeting

The consensus was that calibrations and other non-metrological adjustments must be sealed. It was recommended that, for purposes of type evaluation, this requirement be adopted nonretroactively after 5 years. After 10 years, the requirement will be adopted retroactively in Handbook 44. This should allow sufficient time for manufacturers to make modifications to their instruments. In the interim, meters having provisions for sealing must be sealed.

## Discussion

As in previous discussion of this topic, the opinion was expressed that someone bent on fraud will find a way to cheat. Falsifying data or using incorrect sample weights were cited as examples of how this might be done. The response was that other requirements in Handbook 44 help to reduce fraud, e.g., samples being weighed must be visible to the customer. It was acknowledged that instrument design cannot eliminate all fraud, but it is reasonable to ask that instruments be designed in such a way that fraud is not made easy.

The sector feels it necessary to look at different levels of instrument adjustment and determine which can legitimately be made by the operator. Calibrations should be sealed, and that the operator should not be able to make bias adjustments. The goal is to minimize operator adjustment, with future requirements being that no operator adjustments are allowed.

The sector recognizes that the NCWM will determine the dates for implementing recommendations on sealing instruments, but has suggested realistic dates for manufacturers to have adequate time to design to future requirements. Related manufacturer questions are: (1) How long will it take to introduce a new product? (2) How long can current models be used? (3) How long can the future version be used?

D. Acceptance tolerances

Results of the Meeting

The group agreed that current tolerances appear to be too stringent for certain grain types, oats in particular. The moisture meter subcommittee was tasked with recommending changes to bring Handbook 44 tolerances in line with those established for type evaluation testing and verification of calibration adequacy.

E. Calibration verification

Results of the Meeting

It was agreed that UR 3.10 adequately covers the requirement that only the most recent calibration and calibration constants be used. The current calibration identifier/number and the calibration constants, if appropriate, will be listed on the certificate of conformance.

The sector agreed that each calibration must be identified by a unique name and version number, and that inspectors must be able to recall and verify the version of the calibration being used.

If instrument calibrations are digitally stored in an electronically alterable form, the instrument must make automatic calibration checks. This requirement would be nonretroactive and effective immediately upon adoption for both type evaluation and field enforcement of Handbook 44 code.

Discussion

Concern was expressed over how inspectors will verify that the correct calibration is being used on devices where the calibration is stored on a disk in files that cannot be read by the user. Is identification of the calibration contained on the disk sufficient? Is it adequate to have the version number displayed when a calibration is selected on the instrument? A similar question was asked regarding instruments where the calibration is transferred onto the instrument via a modem. How do we verify that the correct calibration is being used? It seems necessary that calibrations be identified positively by a unique name or version number, and that inspectors be able to recall or verify the version being used, by viewing either the actual calibration constants or the version number.

Automatic calibration checks are different from audit trails, which are not being used to look at the integrity of numbers. A calibration check is something that the instrument needs to do automatically. The important consideration is that the instrument not give an erroneous answer if the calibration is corrupted. In fact, it was felt that the instrument should not give a moisture reading if the calibration has been corrupted. The instrument should provide an error code or other indication that there is a problem. This may be difficult to check. In order to check this, type evaluation personnel would need to corrupt a calibration and check to see that the instrument shows an error code. The manufacturer would have to provide procedures for checking this feature. It is recommended that this requirement be nonretroactive and adopted immediately for purposes of enforcing Handbook 44 code, and that all devices submitted for type evaluation meet this requirement.

NIR Handbook 44 Chapter

The sector agreed that the following changes apply to both the Moisture Meter Code and the Near-Infrared Analyzer Code:

1. The Grain Moisture Meter code should include a statement indicating that the minimum height of the digital characters used to indicate moisture content shall be consistent with OIML requirement 4.4.5. "Digital Indicating Devices." This requirement specifies a minimum character height of 10 mm.
2. In Section S.1.7.1.(a) of the Grain Moisture Meter code, "and over the frequency range of 59.5 to 60.5 Hz" should be changed to "at a nominal frequency of 60 Hz."
3. A constituent value (moisture or protein) should not be recorded or displayed when the constituent value is beyond the operating range of the device or the calibration. Simply flashing the displayed constituent value is not in itself an adequate indication that the constituent range has been exceeded, and language indicating that this is an acceptable indication shall be deleted from the Grain Moisture Meter code (S.1.6.2). Flashing the displayed constituent value

is acceptable if this action is clearly defined as an error indication. It is recommended that the requirement that constituent values not be recorded or displayed when the calibration range is exceeded be adopted nonretroactively for type evaluation purposes after 5 years, and be adopted retroactively for purposes of Handbook 44 enforcement after 10 years. This should allow sufficient time for manufacturers to make design changes.

### III. Type Evaluation Criteria (Publication 14)

#### A. Evaluation Process

#### Results of the Meeting

1. The manufacturer shall provide an instrument equipped with all calibrations required for type evaluation testing and subsequent field use. Calibrations will not be developed as part of type evaluation testing.
2. Instruments meeting tolerances for accuracy, precision and reproducibility for a test set representing a limited, 6% moisture range will be approved for that grain type. The manufacturer will provide data supporting use of the meter in the field over a wider moisture range. The certificate of conformance shall indicate both the moisture range verified by type evaluation, and the full moisture range of the manufacturer supplied calibration.
3. Participation in the on-going national calibration program will be mandatory. Calibration adequacy will be reviewed each year, and the calibration range on the certificate of conformance updated as appropriate. Manufacturers will be responsible for making calibration updates, and failure to make required updates shall result in revocation of the certificate of conformance.

#### Discussion

Sector members did not feel that it is realistic to calibrate and type evaluate a moisture meter in a single harvest season. The manufacturer must be responsible for supplying a calibrated instrument and will be responsible for developing updated calibrations as required.

One concern with using manufacturer supplied calibrations is that the reference results used to develop the calibration may not be in line with FGIS air oven results. The committee discussed whether or not manufacturers should be required to participate in a round-robin collaborative study with FGIS to demonstrate agreement between reference laboratories. Although there was not a lot of enthusiasm for this idea, the issue was not clearly resolved.

The sector members did not agree to the second phase of the proposed two-phase evaluation process that would have allowed evaluation over the entire calibration range. NCWM members would have to be assured that type evaluation over a 6% moisture range is an adequate test of the calibration. Manufacturers' data is the key to demonstrating that the calibration will perform adequately over the moisture range.

There was some discussion of what to do in the event that an instrument (or calibration) fails to perform adequately over the 6% moisture range. It was generally agreed that the manufacturer should be supplied the test data and have an opportunity to revise the calibration and resubmit the instrument with the new calibration. The manufacturer would need to demonstrate that the entire calibration had been improved, and not just the portion of the calibration falling into the test range. A different test set would have to be used when the instrument is resubmitted for testing.

The group agreed that participation in the national calibration program should be mandatory, with several related issues requiring further discussion. Criteria need to be developed for determining when a calibration update is required. It was suggested that the criteria for updating calibrations be the same as that used by FGIS to update calibrations on their official instrument. This may not be possible because FGIS uses calibration data collected over a 3- to 5-year period, and similar data will not be available when the national calibration program is initiated. Questions were also posed regarding verification that calibration changes or updates have the desired effect.

Several members of the group indicated that the goal of uniformity could be best achieved if instruments are calibrated to agree with the FGIS official meter instead of the air oven reference method. The question was asked whether it would be permissible to change a calibration to bring it into line with the FGIS official meter, even if this moved the calibration further away from the air oven reference. Trying to achieve agreement with the FGIS official meter may not be desirable because



## Executive Committee

FGIS calibrations are periodically updated, and the best long term strategy is to achieve agreement with the air oven reference method.

### B. Checklist for compliance with Handbook 44 Code

#### Results of the Meeting

Review of the checklist resulted in the following recommendations for revision to Handbook 44:

1. Digital display of moisture results should be required. It was recommended that this requirement take effect immediately upon adoption for purposes of type evaluation, and be adopted retroactively in Handbook 44 in 10 years.
2. Final readout must be in percent moisture content (wet basis) with no adjustment of the results required. Calibration or conversion charts will not be allowed. It was recommended that this requirement take effect immediately upon adoption for purposes of type evaluation, and be adopted retroactively in Handbook 44 in 10 years.

#### Discussion

The sector expressed concern over how to handle instruments that provide multiple measurements including "unapproved" results, such as test weight, or instruments that measure moisture content for grain types not included in the type evaluation program. Several members felt that manufacturers should have the option of displaying this "unapproved" information on NTEP approved meters. It was suggested that the Executive Committee be consulted as to whether this information should be displayed on NTEP approved instruments. If not, does NCWM want to regulate measurement of these factors?

Suggested revisions to the checklist include:

G-S.2. Facilitation of Fraud - Include recommendations discussed earlier regarding sealing calibrations and non-metrological adjustments.

G-S.5.1. Indicating and Recording Elements - The intent of defining a zero indication is to enable the customer to identify the starting and ending point of a measurement. This requirement is only applicable for those meters that go to 0.00 before a reading, and the wording should be revised to say "If provided, the zero indication . . . ."

G-S.5.2.2. Digital Indication and Representation - Reference to this code item needs to be added to the checklist. (Question - Can we verify that a digital value "rounds off" to the minimum unit that can be indicated or recorded? Does this mean using intermediate results and calibration coefficients to calculate the final moisture as a check?)

G-S.5.2.3. Size and Character - Adopt the OIML minimum height requirement (10 mm) for displayed digits.

G-S.5.4. Repeatability of Indications - Remove this item from the checklist.

Remove reference to analog indications from the checklist: S.1.2.1 to S.1.2.3, S.1.3.1 to S.1.3.5, and G-S.5.2.1.

S.1.6.2. Operating Range - The committee discussed whether instruments should automatically indicate whether any operating range has been exceeded, including test weight and operating temperature. There was no clear consensus on this issue.

S.1.7.2. Power Interruption - Remove this item from the checklist.

S.1.9. Operating Temperature - The subcommittee was tasked with determining how to specify and verify operating ranges for sample and instrument temperature. The group felt it will be necessary to develop tolerances for room temperature accuracy, before acceptable performance at temperature extremes can be defined.

S.3.3. Conversion and Correction Tables - This requirement should be dropped from the checklist, but retained in Handbook 44. (The reasoning for retaining the requirement in Handbook 44 is that the moisture for some specialty crops are apparently determined using a conversion chart to adjust moisture results obtained on a fully automatic meter using the calibration for another grain type. The states may need this requirement to regulate non-NTEP seeds.)



The sections "Digital Indications and Recording Elements" and "Design of Direct Reading Grain Moisture Meters" should be combined.

C. Test procedures and tolerances

Results of the Meeting

1. The sector endorsed subcommittee recommendations that a stable moisture Hard Red Winter wheat sample or the most consistent applicable grain be used to conduct tests verifying the effects of fluctuations in power supply, power interruptions, storage temperature, temperature cycling, leveling, endurance (life test), warm-up time, operating temperature, and humidity. The subcommittee will continue with the development of basic instrument tests.
2. The sector agreed upon the 6 percent moisture ranges to be used for accuracy, precision, and reproducibility tests for the different grain types. The moisture ranges for corn and rice were changed from 10-16% to 12-18%. The moisture meter subcommittee will recommend tolerances for individual 2% moisture intervals.

IV. Funding for the National Calibration Program

A. Calibration requirements for type evaluation approval

Results of the Meeting

Sector members agreed that the manufacturers should be responsible for type evaluation costs. The manufacturers were unwilling to commit to covering the cost of the first year of participation in the national calibration program without knowing what the cost of the program will be.

Discussion

It was clarified that not all models of an instrument "type" need to be tested. Typically, the most sophisticated model in a model series is tested.

Costs associated with participation in the NTEP program were roughly estimated at \$5,000 for type evaluation, and \$1,000-2,000 per grain type per year for collecting calibration data. Concern was expressed that paying for the first year of participation in the calibration program could exceed \$20,000. Better estimates of costs are needed once the testing and calibration programs have been more fully defined.

B. Funding long-term calibration support

Results of the Meeting

Fees need to be collected to support an on-going calibration program. There is general agreement that moisture meter users will ultimately be charged for the calibration development phase of the NTEP approval program. It is unclear how such charges can be assessed and collected. One difficulty faced by manufacturers in assessing a calibration fee is that calibrations are not typically updated on an annual basis. Thus, user fees could not be uniformly and regularly assessed by simply charging users for calibration updates. Many state Weights and Measures programs are not currently charging fees for field inspection of moisture meters. It was suggested that problems associated with assessing a user fee should be reported to the Executive Committee to see if there is any way that the NCWM could assess a calibration fee as part of a national program. One possibility is for NTEP to collect an annual maintenance fee on the certificate of conformance. In this instance, the maintenance fee would be collected from users instead of from the manufacturer. One key to supporting a national calibration program appears to be collecting user fees for all meters used in commercial grain sales, regardless of whether or not the instrument is NTEP approved.

V. Status of Equipment Currently Approved by the States and by FGIS

Results of the Meeting

It was agreed that instruments currently approved by either the states or FGIS should not receive NTEP approval on the basis of a "grandfather" clause.

## VI. Scheduling Future Meetings

### Results of the Meeting

The next sector meeting was scheduled for October 5-7, 1992 in Chicago at a hotel near O'Hare airport. This meeting will concentrate on development of test criteria for moisture meters. NIR wheat protein analyzers will be addressed at subsequent meetings. It was agreed that a meeting of the subcommittee will be arranged prior to the next sector meeting.

## VII. Additional Issues Requiring Discussion

### Results of the Meeting

The following items were suggested for discussion at future meetings:

1. How does state enforcement fit into the program? i.e., Will national calibrations be checked using samples from a specific state or location?
2. Coordinate activity with states to get more grain samples in to support this effort.

### **Participants**

June 10-12, 1992

Name	Organization
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Allison Pflug . . . . .	CSC Scientific
Rich Pierce . . . . .	USDA/FGIS
Joseph Rothleder . . . . .	California Div of Measurement Standards
Tom Runyon . . . . .	Seedburo Equipment Company
Fred Seeber . . . . .	Shore Sales Co., GEAPS
Cheryl Tew . . . . .	North Carolina Dept of Agriculture
Robert Wittenberger . . . . .	Missouri Weights and Measures
Richard Wothlie . . . . .	Maryland Weights and Measures

## Meeting Summary

Subcommittee of the NTETC Moisture Meter Sector  
August 19-21, 1992

## Attendees

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1. Jack Barber, Dickey-john      | 5. Cliff Watson, Consultant       |
| 2. Cassie Eigenmann, Dickey-john | 6. Bob Wittenberger, Missouri W&M |
| 3. Dave Funk, FGIS               | 7. Will Wothlie, Maryland W&M     |
| 4. Rich Pierce, FGIS             |                                   |

The agenda for the meeting is listed below:

- I. Goals of the Meeting
- II. Accuracy, Precision, and Reproducibility Requirements for Instruments Operating at Room Temperature
- III. Handbook 44 Tolerances
- IV. Instrument Tests Using Hard Red Winter Wheat
- V. Tolerances and Test Procedures to Verify Temperature Operating Ranges
- VI. Tolerances for Calibration Performance

## RESULTS AND DISCUSSION

The subcommittee reviewed the meeting agenda (Attachment 1) and discussed approaches to use in developing type evaluation test procedures and tolerances for moisture meters. The group agreed on several basic issues. For example: Type evaluation tolerances should be some fractional portion of Handbook 44 tolerances. Type evaluation tolerances for accuracy should be consistent with tolerances developed for on-going calibration review. The consequences of failing basic instrument tests should be more serious than the consequences for failing tests related to calibration adequacy, and test tolerances should be developed accordingly.

There was extensive discussion on whether we should be testing basic instrument performance, or evaluating the performance of the instrument and the calibration. This issue was previously discussed by the Sector, and the general feeling then was that each calibration would need to be individually approved. A basic concern with having to evaluate both the instrument and the calibration is that it does not appear feasible to approve an instrument for all grains included in the NTEP program in the first year. Discussion of this issue included how to handle "unapproved" calibrations on instruments having NTEP approval for some grain types. It appears that full approval will be achieved gradually over a several year period.

Given that the approval process will be lengthy, the subcommittee felt that this time would be most productive if instruments were enrolled in the on-going calibration program as soon as possible. It was suggested that instruments be enrolled in the calibration program once they have been approved for use with several grains, and that the calibration data be used to approve the instrument for additional grain types. The following overall test procedures were developed to facilitate discussion of specific type evaluation and calibration requirements.

1. The Sector should specify a group of grain types (at least 3) to be used in evaluating the calibration capability of specific instrument models and basic measurement technologies. The grain types selected should be commercially significant and should bracket the characteristics of the grain types included in the NTEP program. The suggested test grains for dielectric moisture meters are: corn, Hard Red Winter (HRW) wheat, and soybeans.
2. For each specified grain, a manufacturer seeking NTEP approval must supply calibrations and calibration data demonstrating that an instrument model is capable of meeting accuracy, reproducibility, repeatability, and temperature sensitivity specifications for each of three specified 2% moisture intervals, and that the calibration is "a proper fit" (to be defined) to the available calibration data over the full moisture range.

3. Basic instrument performance will be tested for sensitivity to factors such as instrument temperature, humidity, leveling, and power supply voltage using HRW wheat.
4. The instrument will then be evaluated for accuracy, reproducibility, repeatability, and sample temperature sensitivity using each of the three selected grain types. If an instrument model meets specifications and tolerances for all three grains, the model is "approved for grain moisture measurement" and will be accepted into the on-going calibration program. Failure to participate in the on-going calibration program would trigger the revocation of the certificate of conformance for that grain moisture meter.
5. The first year following "instrument approval," calibrations for additional grain types included in the NTEP program will be listed as "pending approval" based upon review of manufacturer supplied data. In order to be placed on the "approved" list, a calibration must be shown to be "a proper fit" to available calibration data, and to yield prediction statistics that are "reasonable" for the grain type. After the initial year in the calibration program, NTEP will review the data from the on-going national calibration program to determine whether the supplied calibration is "a proper fit" to the available data.
6. If a calibration does not meet the (to be established) criteria for "a proper fit," the manufacturer shall develop a revised calibration that meets the criteria. Failure to do so within a specified time period shall result in the removal of that grain type from the "approved calibration list" for the model. This is equivalent to revoking the certificate of conformance for the grain type.

The subcommittee agreed that moisture meters failing to meet type evaluation test criteria for any of the three selected grains would fail type evaluation for all three grain types. There will be no partial instrument approval. The subcommittee then discussed how to handle type evaluation of instruments not designed for use with all three selected grain types. One suggestion was to approve two different classes of instruments. Class A for generic grain moisture meters approved as outlined above. Class B approval would be a limited approval applying only to certain grain types. Class B approval would not be granted for an instrument capable of being used with corn, HRW wheat, and soybeans. It is not intended that Class B approval provide an alternative approval route for instruments that do not make the grade under Class A testing.

Only those grains tested annually by FGIS will be included in the NTEP program. The grains included in the NTEP program may change as the FGIS program changes, and priorities are set to represent the most economically significant grain types.

## **II. Accuracy, Precision, and Reproducibility Requirements for Instruments Operating at Room Temperature**

### **Results of the Meeting**

The subcommittee agreed that moisture meters should be tested for accuracy, repeatability (precision), and reproducibility over a 6% moisture range for corn (12-18%), Hard Red Winter wheat (10-16%), and soybeans (10-16%). Reasons for selecting these three grains for testing include:

1. These grains are representative of the diverse grain types that will be evaluated, i.e., oil vs cereal, size, shape, and chemical composition.
2. They are economically important grains, and the moisture ranges being tested are also economically significant.
3. These grains typically provide uniform results, which allows the development of meaningful and significant test criteria.
4. Samples are readily available and may be easily stored for these grain types and moisture ranges.

Two instruments will be tested over a 6% moisture range using 10 samples selected from each 2% moisture interval. The sample set will be screened using the FGIS official meter model and the air oven. Samples where the official meter model disagrees from the air oven by more than the Handbook 44 acceptance tolerance will be deleted and another sample selected to replace it. No sample set will be used where the standard deviation of the differences between the FGIS official meter model and the air oven for the 10 samples in a moisture interval exceeds one-half the Handbook 44 acceptance tolerance

minus 0.1, i.e., in the 12-14% interval for corn the standard deviation of the differences should not exceed  $(0.4 - 0.1) = 0.3$ .

Three replicates will be run on each instrument for each sample, resulting in a total of 180 observations per grain type (2 instruments x 3 moisture intervals x 10 samples x 3 replicates).

Accuracy, repeatability, and reproducibility tests will be conducted with the samples and instruments at room temperature. Room temperature is defined as  $22^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

Accuracy. The two tests for accuracy are bias (meter versus oven) and the Standard Deviation of the Differences (SDD) between the meter and the air oven for each of the 2% moisture intervals. Each instrument will be tested individually.

$$\text{Bias} = \frac{\sum_{i=1}^n (xi - ri)}{n}$$

where,

$xi$  = average predicted moisture content for sample  $i$  (3 replicates)

$ri$  = reference moisture content for sample  $i$

$n$  = number of samples per 2% moisture interval ( $n=10$ )

$$\text{SDD} = \left( \frac{\sum_{i=1}^n (yi - y)^2}{n-1} \right)^{1/2}$$

where,

$yi = xi - ri$  (see above)

$y$  = average of the  $yi$

$n$  = number of samples per 2% moisture interval ( $n=10$ )

Tolerances for both of these tests will be one-half the Handbook 44 acceptance tolerance for the appropriate 2% interval. Use the maximum acceptance tolerance for intervals where the tolerance changes with the moisture content, i.e., in the 16-18% interval for corn use  $1/2 \times 0.05 \times 18 = 0.45$  for the tolerance. (Note that this assumes that acceptance tolerances in Handbook 44 will be changed to equal maintenance tolerances.) Specific tolerances are:

<u>Grain Type</u>	<u>Moisture Range</u>	<u>Tolerance</u>
Corn	12 - 14%	0.40
	14 - 16%	0.40
	16 - 18%	0.45
HRW wheat	10 - 12%	0.35
	12 - 14%	0.35
Soybeans	14 - 16%	0.35

Repeatability. The Standard Deviation (SD) of the three replicates will be calculated for each sample in a 2% moisture interval and pooled across samples. Each instrument will be tested individually. The equation used to calculate SD is:

where,



$$SD = \left( \frac{\sum_{i=1}^n \sum_{j=1}^3 (P_{ij} - \bar{P}_i)^2}{2n} \right)^{1/2}$$

$P_{ij}$  = predicted moisture for sample  $i$  and replicate  $j$

$\bar{P}_i$  = average of the three predicted moisture values for sample  $i$

$n$  = number of samples per 2% moisture interval ( $n=10$ )

Tolerances for repeatability are 0.25 x the maximum Handbook 44 acceptance tolerance for the 2% moisture interval. Specific tolerances are:

<u>Grain Type</u>	<u>Moisture Range</u>	<u>Tolerance</u>
Corn	12 - 14%	0.20
	14 - 16%	0.20
	16 - 18%	0.225
HRW wheat	10 - 12%	0.175
	12 - 14%	0.175
Soybeans	14 - 16%	0.175

Reproducibility. The results for each of the three replicates will be averaged for each instrument using samples over the 6% moisture range and the Standard Deviation of the Differences (SDD) between instruments will be calculated using the following equation:

$$SDD = \left( \frac{\sum_{i=1}^n (d_i - \bar{d})^2}{n-1} \right)^{1/2}$$

where,

$$d_i = \bar{P}_{1i} - P_{2i}$$

$\bar{P}_{1i}$  = average of three replicates for sample  $i$  on instrument 1

$P_{2i}$  = average of three replicates for sample  $i$  on instrument 2

$\bar{d}$  = average of the  $d_i$

$n$  = number of samples in all three 2% moisture ranges ( $n=30$ )

Tolerances for repeatability are 0.3 x the maximum Handbook 44 acceptance tolerance for the 6% moisture range.

Specific tolerances are:

<u>Grain Type</u>	<u>Moisture Range</u>	<u>Tolerance</u>
Corn	12 - 18%	0.27
HRW wheat	10 - 16%	0.21
Soybeans	10 - 16%	0.21

### III. Handbook 44 Tolerances

#### Results of the Meeting

The subcommittee recommended that Handbook 44 tolerances be changed so that acceptance tolerances for all grains are set equal to the maintenance tolerances.

The subcommittee recommended that oats be grouped with corn, rice, and sunflowers for purposes of applying Handbook 44 acceptance and maintenance tolerances.

#### Discussion

Separate acceptance and maintenance tolerances do not seem applicable for moisture meters, and cannot be applied in the same way that they are to scales. A scale can be adjusted to provide a "correct" reading (zero error), but may then drift after adjustment and not provide the same accurate reading in the field. Thus, it makes sense that scales be adjusted to a more stringent acceptance tolerance initially, and then allow a wider maintenance tolerance to be used for field testing. Moisture meters cannot be adjusted to a zero error, because moisture content is not being measured directly and calibrations represent only the best fit of available data. The "error" in moisture measurement will differ for each grain sample measured.

The subcommittee considered developing Handbook 44 tolerances for three classes of grain instead of the existing two classes. The general feeling was that this would be a big step that might be difficult to sell to the conference. This is a particular concern because the data we have available suggests that some tolerances need to be widened.

There is some concern that tolerances are still not appropriate for all grains covered by Handbook 44. However, the maintenance tolerances for corn, HRW wheat, and soybeans appear to be reasonable and should not prevent approval of capable instruments. Corn might be a possible exception. The subcommittee felt that it would be easier to make meaningful changes to Handbook 44 tolerances once data from the on-going calibration program are available. It was noted that we should be careful about making frequent requests to the conference for changes in Handbook 44 tolerances.

### IV. Instrument Tests Using Hard Red Winter (HRW) Wheat

#### Results of the Meeting

The subcommittee reviewed the tests and tolerances previously developed for using HRW wheat to test fluctuations in power supply, storage temperature, and leveling. Test procedures were further defined and tolerances stated numerically instead of as a fraction of the acceptance tolerance. This latter step was taken because of the potential change in Handbook 44 acceptance tolerances.

The committee recommended tests and tolerances for using HRW wheat to test for warm-up time, humidity effects, instrument stability, and instrument temperature sensitivity. All instrument tests will be conducted on each of the two instruments submitted by a manufacturer.

**Power Supply.** A single HRW wheat sample with a moisture content between 12-14% will be dropped 10 times with the meter operating at a nominal voltage of 117 V. The same sample will be dropped 10 times with the meter operating at a voltage of 100 V. The voltage level will then be increased to 130 V and the sample dropped 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average moisture for 10 drops made at both the reference and the respective test voltages. The maximum allowable bias change from the reference is  $\pm 0.10$ . The maximum allowable standard deviation of 10 drops (precision), at any of the three voltage levels, is 0.10.

Storage Temperature. Storage temperature tests will be conducted as specified in the March 18-19, 1992, subcommittee meeting summary. The maximum bias shift allowed for the average of 10 drops before and after temperature cycling was changed to  $\pm 0.20$ .

Leveling. Tests for leveling will be conducted as specified in the March 18-19, 1992 subcommittee meeting summary. The tolerance for bias was changed to  $\pm 0.10$ .

Warm-up Time. The following tests procedures were suggested to check warm-up times recommended by the manufacturer. If no warm-up time is recommended by the manufacturer, it will be assumed that accurate results will be provided immediately upon having the instrument powered on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time a single wheat sample will be dropped 10 times through the instrument. After waiting for a period of time equal to two times the manufacturer suggested warm-up time, the sample will be dropped 10 more times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered up and then again after 1 hour. The maximum allowable bias shift is 0.10 for the average of 10 readings.

Humidity. Each instrument (power on) will be placed in an environmental chamber at 20 °C and a relative humidity of 20% for 16 hours. A single HRW sample will then be analyzed 10 times. The relative humidity will be raised to 90% (20 °C) and, after the instrument has equilibrated at this humidity for 16 hours, the HRW sample will again be analyzed 10 times. A maximum bias shift of 0.20 is allowed between the average of 10 readings made at 20% relative humidity and those made at 90% relative humidity.

Instrument Stability. HRW wheat samples will be used to test instrument stability over a minimum 4-6 week period. A set of three samples, one from each of the three 2% moisture intervals will be selected for testing. These samples may be a subset of the HRW test set for accuracy, repeatability, and reproducibility tests. Each of the 3 samples will be dropped 5 times through each of the two meters prior to running any other type evaluation tests, particularly before running the storage temperature test. The average moisture content obtained for the 15 observations (3 samples  $\times$  5 replicates) will be recorded. The 3 samples will be retested once all other type evaluation testing has been completed (within 4 to 6 weeks). The maximum allowable bias shift over the 4 to 6 week period is 0.20.

Instrument Temperature Sensitivity. Instrument temperature sensitivity tests will be run using three HRW wheat samples, one selected from each of the 2% moisture intervals. Each sample will be cut into 3 portions for testing at room temperature, at a "hot" temperature, and at a "cold" temperature. Both the sample and the instrument will be equilibrated to the test temperature. (How long? 4 hrs?) (How many drops at each temperature level per sample? 3 drops?)

The "hot" temperature is defined as the upper operating limit claimed by the manufacturer minus 4 °C. The "cold" temperature is defined as the lower operating limit claimed by the manufacturer plus 4 °C. Room temperature has been previously defined as 22 °C  $\pm$  2 °C.

The maximum allowable moisture bias will be  $\pm 0.35$  from the average moisture measured at room temperature.

#### V. Tolerances and Test Procedures to Verify Temperature Operating Ranges

##### Results of the Meeting

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is 11 °C (20 °F). The committee agreed that the sample temperature sensitivity test should be conducted for corn, HRW wheat, and soybeans. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature + 11 °C to room temperature - 11 °C. Using our definition for room temperature of 22 °C, this means testing with the sample at 11 °C (52 °F) to 33 °C (91 °F). Both instruments will be tested.

Two (2) samples will be selected from each of the three 2% moisture intervals for each of the three grains - corn, HRW wheat, and soybeans. Tests will be run for each grain (How many drops for each sample?) at both the hot and cold

temperature extremes, and the overall bias for the   ? observations (2 samples x 3 moisture intervals x   ? replicates) run at each temperature extreme must agree within the following tolerance

**Note:** The "?" refers to values that have not yet been determined.

Corn	0.45
Wheat	0.35
Soybeans	0.35

### Discussion

The subcommittee recommends that temperature adequacy be checked as part of the on-going calibration effort, and that temperature data be collected as part of the routine calibration effort. There was no discussion of applying tolerances to temperature data collected as part of the calibration program. It is recommended that the test described above be the only formal test for sample temperature sensitivity.

## **VI. Tolerances for Calibration Performance**

### Results of the Meeting

The subcommittee discussed the need to test calibration performance against established criteria at the following stages of the type evaluation process: (1) evaluation of the calibration data supplied by the manufacturer with the application for type evaluation, (2) evaluating instrument and calibration performance over the 6% moisture range for corn, HRW wheat and soybeans (discussed earlier), (3) initial calibration approval for grains other than corn, HRW wheat, and soybeans, and (4) review of on-going calibration data collected as part of the national calibration program.

Calibrations would be approved if the bias of all samples in a 2% moisture interval does not exceed one-half of the Handbook 44 acceptance tolerance. Calibrations for corn, HRW wheat and soybeans would be approved based upon type evaluation testing over a 6% moisture range and manufacturer supplied data over the remainder of the calibration range.

Calibrations for other grains would be approved based upon data collected as part of the on-going national calibration program. Approval tolerances would again be one-half of the Handbook 44 acceptance tolerance, and would be applied in 2% intervals over the range of available data. The grains to be included in the on-going calibration and NTEP moisture meter program are:

Corn	Hard White wheat	Six-rowed Barley
Durum wheat	Soft Red Winter wheat	Oats
Eastern White wheat	Sunflower Seed	Long Grain Rough Rice
Western White wheat	Sorghum	Medium Grain Rough Rice
Hard Red Spring wheat	Soybeans	Short Grain Rough Rice
Hard Red Winter wheat	Two-rowed Barley	

Grain types may be added to or deleted from this list as economic importance of the various grains changes. Decisions by FGIS to add or remove grain types from the annual calibration review will affect which grains are included in the NTEP program.

Tolerances used to require a change in "approved" calibrations will include the application of a 95% confidence interval to the maximum tolerance for each 2% moisture interval. The intent of applying the confidence interval is to avoid forcing a calibration change based upon insufficient data. After only one year of data collection, the number of samples in some intervals will be small and the confidence interval may be as large as the tolerance limit. In this instance, the calibration would have to be extremely poor before a calibration change would be mandated. After the instrument has been in the calibration program for several years, the confidence interval should be reduced to approximately 0.05 and recommendations can be made with greater certainty. The latest 3 years of data will be used to make decisions regarding the need to make a calibration update.

The status of all calibrations will be listed on the certificate of conformance. The suggested categories are (1) approved, (2) pending, (3) not approved, and (4) not available. The categories can be described as follows:

## Executive Committee

Approved: Corn, HRW wheat, and soybean calibrations will be approved based upon performance over the 6% type evaluation moisture range and manufacturer supplied data. Continued approval requires acceptable performance as part of the ongoing national calibration effort.

Calibration data, collected as part of the national calibration program, must indicate that calibration performance meets the tolerances for each 2% moisture interval before additional grains will be approved. Continued approval again requires acceptable performance as part of the national calibration effort, i.e., none of the average differences between predicted and reference values for the respective 2% moisture intervals exceed 1/2 of the Handbook 44 acceptance tolerance + the 95% confidence interval.

Pending: A new calibration would automatically be placed in this category.

This category also includes calibrations that have not yet met the criteria for approval, but that also have not performed badly enough to be listed as not approved. Such calibrations may be used on NTEP approved meters.

Not

Available: A calibration is not available for this grain included in the national calibration program. A calibration for this grain type shall not be used on NTEP approved meters.

Not Approved: The calibration does not meet the criteria for either "Pending" or "Approved" status, and has not been revised by the manufacturer. Such calibrations shall not be used on NTEP approved meters.

The subcommittee feels that a group, perhaps the Moisture Meter Sector, should meet each year to help make determinations regarding which calibrations need to be updated. This group would take into consideration unusual growing conditions when making decisions related to calibration adequacy.

### Discussion

The subcommittee discussed whether manufacturers should be required to participate in a collaborative air oven study with FGIS. The consensus of the subcommittee was "no" due to the concern over manufacturer data that predated the collaborative study. This data might still be very meaningful to the calibration and could represent samples moisture ranges that are difficult to obtain. This does not preclude voluntary collaborative studies between a manufacturer and FGIS.



## ATTACHMENT 1

Subcommittee of the NTETC Moisture Meter Sector  
August 19-21, 1992

## I. Goals of the Meeting

The purpose of the meeting is to develop type evaluation test procedures for moisture meters and to establish corresponding tolerances.

## II. Accuracy, precision, and reproducibility requirements for instruments operating at room temperature.

It is recommended that two instruments be tested over a 6% moisture range using 10 samples selected randomly from each 2% moisture interval. Three replicates will be run on each instrument for each sample, resulting in a total of 180 observations (2 instruments x 3 moisture intervals x 10 samples x 3 replicates).

Accuracy. Instrument inaccuracies may be reflected by either a large standard deviation of the differences (SDD) between meter readings and the reference method, or a bias between the meter and the reference method. Test procedures may be developed with separate tolerances established for bias and SDD limits, or with a single tolerance established by setting an allowable bias and determining an appropriate confidence interval based upon the SDD.

A consideration favoring the first approach is that instruments with a high SDD should not be eligible for reevaluation without some modification, while a bias problem can be addressed by changing the calibration.

Precision and Reproducibility. It is recommended that the definitions of precision repeatability and reproducibility in the document "Design Criteria and Operational Performance Specifications for Grain Constituent Measuring Instruments Using Near Infrared Spectroscopy" be adopted. Tolerances need to be established for each grain type.

## III. Handbook 44 Tolerances

Do we want to:

- relate accuracy tolerances to Handbook 44 tolerances?
- recommend that acceptance tolerances be the same as maintenance tolerances in Handbook 44?
- regroup grain types within the tolerance classifications? (1) oats, sunflowers, rice, (2) corn, sorghum, barley, (3) soybeans and wheat
- suggest changes to Handbook 44 maintenance tolerances?

## IV. Instrument tests using HRW wheat

Tolerances need to be established/revised for power fluctuation, storage temperature, and leveling tests recommended previously by the subcommittee.

Test procedures and tolerances need to be defined for warm-up time, humidity, and long-term stability/permanence.

The subcommittee should consider developing operating temperature range tests using HRW wheat. This test would be conducted as part of the initial type evaluation, with additional temperature testing required as the instrument is evaluated for more grain types.

Tolerances and test procedures to verify temperature operating ranges.

Should temperature operating ranges be specified by the manufacturer? In Handbook 44? In Publication 14? All of the above?

Should an instrument provide an automatic indication if the temperature operating range is exceeded?

Test procedures and tolerances are needed for use in verifying both accurate operation over the temperature range, and verifying that accuracy is maintained when the sample temperature is 20 °F higher or lower than the ambient temperature.

VI. Tolerances for calibration performance

What data does the manufacturer need to provide with the application for type evaluation?

What tolerances will be used to verify calibration adequacy?

Will the same tolerances be applied to both manufacturer supplied data and calibration data collected as part of an on-going national calibration program?

## MEETING SUMMARY

National Type Evaluation Technical Committee  
Moisture Meter Sector

October 5-7, 1992

The agenda for the meeting is listed below.

- I. Goals for the Meeting
- II. Review Sector Activities
- III. Handbook 44 Code
  - A. Proposed wording for previously agreed to changes
    - 1. Digital indications
    - 2. Indicating when the moisture operating range is exceeded
    - 3. Electric power supply frequency
    - 4. Provision for sealing
    - 5. Minimum sample size
    - 6. Calibration integrity
  - B. Proposed changes not yet resolved
    - 1. Tolerances for grain moisture meters
    - 2. Operating temperature ranges
    - 3. Establish two classes of moisture meters
- IV. Type Evaluation Criteria (Publication 14)
  - A. Review Handbook 44 requirements after an evening "hands on" session with different meter types
  - B. Basic instrument tests
    - 1. Basic tests using HRW wheat
    - 2. Verifying temperature operating ranges
  - C. Basic instrument/calibration approval testing
    - 1. Basic instrument/calibration approval using corn, HRW wheat, and soybeans
    - 2. Establish two moisture meter classes
    - 3. Sample set selection
    - 4. Accuracy, precision and reproducibility tests
  - D. Instrument approval for additional grain types
    - 1. Grain types included in the NTEP program
    - 2. Use data from the National Calibration Program to approve calibrations for additional grain types
    - 3. Establish a review committee to review annual calibration data and recommend calibration updates
    - 4. Use of moisture calibrations not covered by the NTEP program
- V. Funding for the Approval Program
  - A. Type evaluation costs
  - B. Support for the National Calibration Program
- VI. Enforcing Handbook 44 Code
  - A. State weights and measures activities to support the NTEP moisture meter program
    - 1. Procedures for updating calibrations on field instruments
    - 2. Field check samples
    - 3. Collecting representative calibration samples
- VII. Schedule Sector Activities
  - A. Important deadlines

B. Future meeting dates and locations

## RESULTS AND DISCUSSION

Sector members discussed the general topic of allowing test weight results to be displayed on NTEP approved moisture meters. It was agreed that, for now, test weight features need to be disabled and sealed. The sector has little choice in this matter because there are no type evaluation test criteria for test weight. Manufacturers may want to approach NCWM regarding the development of Handbook 44 code and type evaluation test criteria for test weight.

The sector previously agreed that proposed revisions to Handbook 44 should be adopted immediately for purposes of type evaluation, and that these items should be adopted non-retroactively in 5 years and retroactively after 10 years for purposes of enforcing Handbook 44. Attachment 1 outlines implementation requirements.

### III. Handbook 44 Code

A. Proposed wording for previously agreed to changes

#### Results of the Meeting

1. It was agreed that Handbook 44 code should be changed to allow display and recording of moisture contents beyond the operating range if the moisture result is accompanied by an appropriate error message. Moisture calibrations generally extrapolate well and grain moisture content is not a variable that can be controlled.
2. The sector decided not to specify a nominal power line frequency of 60 Hz instead of the current 59.5 to 60.5 Hz test range. This allows harmonization with OIML requirements.
3. The recommendation on provisions for sealing was editorially changed to clarify that calibrations and metrological adjustments must be sealed. Audit trails will be specified as an alternative to sealing an instrument.
4. Minimum sample size shall be specified as 100 g or 400 kernels or seeds. No volume equivalent will be specified.

B. Proposed changes not yet resolved

#### Results of the Meeting

1. Handbook 44 acceptance tolerances should be set equal to maintenance tolerances, and oats should be grouped with corn, rice, sorghum, and sunflower seeds in Table 1.
2. Moisture results shall not be displayed or recorded when operating temperature ranges are exceeded because temperature is a variable that can be controlled. The following minimum temperature ranges were specified.

Environmental temperature	- 10 °C to 30 °C
Grain temperature	- 0 °C to 40 °C
Difference between meter and sample temperature	- 10 °C

### IV. Type Evaluation Criteria (Publication 14)

A. Review Handbook 44 requirements after an evening "hands on" session with different meter types

#### Results of the Meeting

After the "hands on" session and review of the checklist, sector members agreed to the following changes to Handbook 44.

1. Meters shall be equipped with a communications interface and software supporting the printing of ticket showing information such as date, grain type, grain moisture result, customer identification, an calibration version identification. Customers shall be provided with a printed ticket.
2. For purposes of type evaluation, moisture results need to be reported to the nearest 0.01 percent.
3. Standard abbreviations should be adopted for indicating grain types and classes. It was suggested that FGIS standard abbreviations be used in developing recommended changes to Handbook 44.

#### B. Basic instrument tests

##### Results of the Meeting

The sector approved the recommendations made by the Grain Moisture Meter subcommittee for both the basic tests using HRW wheat and the tests for verifying temperature operating ranges. It was noted that detailed laboratory test procedures still need to be developed.

#### C. Basic instrument/calibration approval testing

##### Results of the Meeting

1. The subcommittees recommendation that basic instrument/calibration approval be based upon performance with corn, HRW wheat, and soybeans over limited 6% moisture ranges was approved. Manufacturer data will be used to verify calibration performance outside these moisture ranges. Instruments meeting all performance requirements will be eligible for the National Calibration Program. Instruments not meeting performance requirements for all three grains will be failed.
2. Instruments not designed for measuring moisture contents of corn, HRW wheat, and soybeans may be type evaluated and approved based upon their performance with individual grains. Approved instruments would be enrolled in the calibration program for that grain and others in the same "grouping." The 17 proposed NTEP grains were separated into the following seven groups.
  - Corn
  - Durum wheat, Eastern White wheat, Western White wheat, Hard Red Spring wheat, Hard Red Winter wheat, Hard White wheat, and Soft Red Winter wheat
  - Sunflower Seed
  - Sorghum
  - Soybeans
  - Two-rowed Barley, Six-rowed Barley, and Oats
  - Long Grain Rough Rice, Medium Grain Rough Rice, and Short Grain Rough Rice
3. The sample set will be screened using the FGIS official meter and the air oven. Samples where the official meter disagrees with the air oven by more than the Handbook 44 acceptance tolerance will be deleted and another sample selected to replace it. No sample set will be used where the standard deviation of the differences between the FGIS official meter model and the air oven for the 10 samples in a moisture interval exceeds one-half the Handbook 44 acceptance tolerance minus 0.1, i.e., in the 12-14% interval for corn the standard deviation of the differences should not exceed  $(0.4 - 0.1) = 0.3$ . Finally, any sample (within a 2% moisture interval) not within three standard deviations of the mean for the test meter will be dropped before analysis of the data.
4. Accuracy, precision and reproducibility tests were basically adopted as recommended by the subcommittee. One change was to allow the manufacturer to make a bias adjustment to the test results for the "accuracy" test. This bias adjustment would have to be applied to across the calibration range.

#### D. Instrument approval for additional grain types



Results of the Meeting

1. It was agreed that the following 17 grains types and classes should be included in the NTEP program:

Corn	Sorghum
Durum wheat	Soybeans
Eastern White wheat	Two-rowed Barley
Western White wheat	Six-rowed Barley
Hard Red Spring wheat	Oats
Hard Red Winter wheat	Long Grain Rough Rice
Hard White wheat	Medium Grain Rough Rice
Soft Red Winter wheat	Short Grain Rough Rice
Sunflower Seed	

2. The subcommittee recommendation that calibrations for grain types not included in type evaluation testing be approved based upon data collected as part of the National Calibration Program. Tolerances will be one-half of the acceptance tolerance and will be applied in 2% intervals over the range of available data. A minimum of 10 samples will be required for the 6% moisture ranges specified for type evaluation. A confidence interval will be applied to tolerances for 2% moisture intervals outside the type evaluation range. An overall bias may be applied to the calibration in making approval decisions.

**V. Funding for the Approval Program**

- A. Type evaluation costs

This item was not discussed due to time constraints.

- B. Support for the National Calibration Program

Results of the Meeting

Dave Funk estimated the cost of collecting calibration for a single instrument model for the 17 NTEP grains at \$12,500/year. This assumes that the samples and air oven results used for the FGIS utilized.

**VI. Enforcing Handbook 44 Code**

- A. State weights and measures activities to support the NTEP moisture meter program

This item was not discussed due to time constraints.

**VII. Schedule Sector Activities**

- A. Important deadlines

This item was not discussed due to time constraints.

- B. Future meeting dates and locations

Results of the Meeting

The next meeting was scheduled for March 3-5, 1992 immediately following the GEAPS meeting in Phoenix.

**Participants**  
October 5-7, 1992

Name	Organization
Jack Barber . . . . .	Dickey-john Corp.
Randy Burns . . . . .	Arkansas Bureau of Standards
Tina Butcher . . . . .	NIST
Dave Funk . . . . .	USDA/FGIS
Mike Hile . . . . .	Arkansas Bureau of Standards
Lowell Hill . . . . .	University of Illinois
Michael van der Matten . . . . .	Tecator (Sinar Technology)
Don Muller . . . . .	Bran + Luebbe
Henry Oppermann . . . . .	NIST
Allison Pflug . . . . .	CSC Scientific
Rich Pierce . . . . .	USDA/FGIS
Joseph Rothleder . . . . .	California Div of Measurement Standards
Tom Runyon . . . . .	Seedburo Equipment Company
Fred Seeber . . . . .	Shore Sales Co., GEAPS
Cheryl Tew . . . . .	North Carolina Dept of Agriculture
Russ Tkachuk . . . . .	Canadian Grain Commission
Cliff Watson . . . . .	Consultant
Robert Wittenberger . . . . .	Missouri Weights and Measures
Richard Wothlie . . . . .	Maryland Weights and Measures

## GRAIN MOISTURE METER SECTOR

## Implementation of Requirements

The implementation of nonretroactive requirements and the dates at which they will become effective for the National Type Evaluation Program and State enforcement are summarized below.

First, add a paragraph to the "Application" section of the Grain Moisture Meter Code that will state that NTEP will only accept devices for type evaluation that comply with the nonretroactive requirements scheduled to take effect on January 1, 1998. State enforcement will be based upon the effective dates identified with each requirement when specific dates are shown.

	NTEP Evaluations	State Enforcement
Nonretroactive Requirements	Effective immediately. All devices submitted for type evaluation must comply with the nonretroactive requirements.	Enforced when the effective date occurs, i.e., January 1, 1998*  This will allow manufacturers to sell current models until January 1, 1998. These devices can be used until January 1, 2003, which is the retroactive date for the requirements.
Retroactive Requirements	Same as for nonretroactive requirements, since the requirements are the same.	All devices used after January 1, 2003 must comply with the requirements that become retroactive as of that date. Essentially, no analog indications will be permitted on devices used after January 1, 2003.

\*NTEP States are not to prohibit the sale of devices without NTEP Certificates of Conformance into commercial applications until the nonretroactive requirements take effect.

## MEETING SUMMARY

National Type Evaluation Technical Committee  
Moisture Meter Sector

March 3, 1993

The agenda for the meeting is listed below.

- I. Goals for the Meeting
- II. Handbook 44 Code
- III. Handbook 44 Checklist
- IV. Type Evaluation Test Criteria - Review
- V. National Calibration Program
- VI. Enforcing Handbook 44 Code
- VII. Schedule Sector Activities

## I. RESULTS AND DISCUSSION

Sector members reviewed issues agreed upon at previous meetings to ensure that these items are appropriately reflected in (1) recommended changes to the Grain Moisture Meter's code in Handbook 44, (2) the checklist for verifying compliance with Handbook 44, and (3) type evaluation test criteria.

## II. Handbook 44 Code

Results of the Meeting

To more clearly indicate that conversion charts will not be allowed, S.1.2. (e) should be revised to read "Moisture content results shall be displayed and recorded as percent moisture content, wet basis."

Acceptable four letter abbreviations (S.1.6.1) for the grain types and classes considered for type evaluation and calibration are:

Durum Wheat	- DURW	Corn	- CORN
Eastern White Wheat	- EWW	Soybeans	- SOYB
Western White Wheat	- WWW	Two-rowed Barley	- TRB
Hard Red Spring Wheat	- HRSW	Six-rowed Barley	- SRB
Hard Red Winter Wheat	- HRWW	Oats	- OATS
Soft Red Winter Wheat	- SRWW	Sunflower Seed (Oil)	- SUNF
Hard White Wheat	- HDWW	Grain Sorghum	- SORG
Long Grain Rough Rice	- LGRR		or
Medium Grain Rough Rice	- MGRR		MILO
Short Grain Rough Rice	- SGRR		

These abbreviations represent minimum requirements for designating grain type.

The sector agreed that deleting the phrases "if equipped to record" and "if the meter is so equipped" from S.1.6.1 and UR.3.4 (a), respectively, would make it clearer that a printer must be available for use with moisture meters, and that the customer must be provided with a printed ticket.

The requirement for customer identification on printed tickets (UR.3.4 (b)) should be dropped. Customer identification is the responsibility of the grain purchaser, and should not be a design requirement for grain moisture meters. It was clarified that "generated by the grain moisture meter system" does not include typing moisture results into a computer file in order to provide a printed result.

The sector agreed to the following editorial suggestions:

1. Soft Red Winter wheat should be added to the list of grains considered for type evaluation and calibration.
2. In S.1.6.1, "(such as Wheat or WHT, HRWW, etc.)" should be changed to "(such as Hard Red Spring Wheat or HRSW, etc.)," because a generic wheat classification is not currently being considered for type evaluation and calibration.
3. "S.1.6.3. Value of Minimum Indication" should be changed to "S.1.6.4. Value of Minimum Indication."

### III. Handbook 44 Checklist

#### Results of the Meeting

The sector agreed that tolerances need to be applied to manufacturer specified temperature ranges when verifying that moisture content results are not displayed or recorded when operating (environmental), grain and temperature difference ranges are exceeded. Operating temperature can be difficult to measure using sensors incorporated into an instrument that is generating heat. Grain temperatures can change rapidly, particularly with smaller grain samples. Heat exchange between the grain and the sample cell makes temperature differences extremely difficult to determine. The recommendation is that the type evaluation laboratory apply a 5 °C tolerance when verifying that moisture results are not displayed when temperature ranges are exceeded. It was suggested that this "tolerance" be discussed with the S&T Committee, i.e., we are proposing to apply a tolerance not specified in Handbook 44 code.

Depending upon the maximum manufacturer recommended temperature difference between the meter and the grain sample, it may not be possible to conduct temperature difference checks at room temperature. Verification is possible by varying laboratory temperature.

#### Discussion

Concern was expressed that suppressing moisture results because of temperature differences between the grain and the meter, especially if a 10 °C differential is specified, will be a problem for users. There is a conflict to provide both rapid and accurate results.

The group discussed whether an instrument capable of operating at extreme temperatures should have to meet requirements for suppressing moisture results if the manufacturer can support claims that the instrument provides accurate results at these temperatures. There was interest in specifying temperature ranges beyond which instruments would not be required to suppress moisture results. It might not be possible to verify that moisture results are suppressed if an extremely wide operating temperature range is specified, i.e., testing would probably not be possible at temperatures outside the range of -10 °C to 45 °C. It was noted that field inspectors could challenge exaggerated operating temperature claims.

Concern was expressed that currently recommended type evaluation tests do not adequately test performance at extreme temperatures, particularly when grain temperatures below 0 °C are specified. Instrument performance can be greatly affected for "frozen" grain samples when moisture contents are above 20%. Currently recommended type evaluation temperature test criteria specify grain moistures below 18%.

### IV. Type Evaluation Test Criteria

#### Results of the Meeting

The sector agreed to the following clarifications and changes to type evaluation test criteria:



1. Room temperature shall be defined as 22 °C +/- 2 °C (68 °F to 75 °F). This is a more reasonable laboratory temperature range to maintain than the 20 °C +/- 2 °C (64.5 °F to 71.5 °F) agreed upon at the last meeting.
2. Instruments will be adjusted to power supply test voltages for a period of 30 minutes prior to analyzing test samples. This will allow a check of thermal considerations such as overheating at higher line voltages.
3. To facilitate testing of instrument temperature sensitivity, manufacturers shall provide a means of disabling the instrument feature for suppressing the display of moisture results when temperature ranges are exceeded.

Sector members reviewed a summary of type evaluation test requirements that estimates the number of unique samples required (122), the total number of instrument analyses (1218), number of instrument analyses between air oven moisture verification tests (6-20), and the total number of air oven tests required (326).

## V. National Calibration Program

### Results of the Meeting

It was agreed that a review committee should meet annually to review calibration results and make recommendations regarding calibration updates. The existing Grain Moisture Meter sector would be a logical group to review calibrations.

The sector recommended that the use of calibrations for non-NTEP grains be allowed on NTEP approved meters. Individual states will be responsible for regulation and testing of calibrations for non-NTEP grains.

### Discussion

The issue of manufacturers using their own data to make calibration updates was examined. It was felt that manufacturers should be encouraged to collect calibration data in addition to that collected in the national calibration program, especially for samples at moisture extremes.

A related question was whether companies would be able to use their own calibrations on NTEP approved meters. For example, could Anheuser Busch develop and use a calibration for a specific barley variety? The review committee would be expected to address these and other issues.

Concern was again expressed over funding for the national calibration program. It was agreed that the type evaluation program would probably not be initiated unless a means of funding the calibration program were identified.

## VI. Enforcing Handbook 44 Code

This issue was not discussed due to time considerations.

## VII. Schedule Sector Activities

### Results of the Meeting

Sector members discussed steps for initiating type evaluation testing. The following program benchmarks and tentative dates were projected:

1. Manufacturers signify their intent to submit an instrument for type evaluation testing - August 1993. Some manufacturers indicated that the lack of specific cost information would make this a difficult decision.
2. Earliest date to submit applications for type evaluation testing - October 1, 1993. March 1, 1994, was suggested as the latest date an application could be submitted and still allow participation in the calibration program for the upcoming year.
3. Check for compliance with Handbook 44 design requirements (checklist) - October 1993.

## Executive Committee

4. Develop a detailed test protocol - November 1993.
5. Begin type evaluation testing - December 1993.

These items need to be discussed further at the next meeting.

The next meeting for the Grain Moisture Meter and NIR Wheat Protein Analyzer sectors was scheduled for August 17-19, 1993, in Kansas City. A noon-to-noon meeting format was suggested.

### Discussion

It was noted that NTEP states cannot require an NTEP certificate until a testing program is in place. Thus, companies are not "forced" to seek immediate type evaluation approval.

Tina Butcher noted that a type evaluation issue currently before NCWM was the initiation of a \$75/year maintenance fee on certificates of conformance. This issue will be voted on in July. She also noted that the fee for issuing or revising certificates of conformance would probably be increased from \$250 to \$550. There was concern over whether this fee would be assessed each time the attachment indicating calibration approval status was updated.

### **Participants**

March 3, 1993

Name	Organization
Anthony Abbate . . . . .	Motomco
Jack Barber . . . . .	Dickey-john Corp.
Randy Burns . . . . .	Arkansas Bureau of Standards
Tina Butcher . . . . .	NIST
Allen Butler . . . . .	Perten Instruments
Carol Dickey . . . . .	Bran + Luebbe
Cassie Eigenmann . . . . .	Dickey-john Corp.
Dave Funk . . . . .	USDA/FGIS
Charles Hurburgh . . . . .	Iowa State University
Lowell Hill . . . . .	University of Illinois
Michael van der Matten . . . . .	Tecator (Sinar Technology)
Allison Pflug . . . . .	CSC Scientific
Rich Pierce . . . . .	USDA/FGIS
Scott Reed . . . . .	Perten Instruments
Joseph Rothleder . . . . .	California Div of Measurement Standards
Tom Runyon . . . . .	Seedburo Equipment Company
Bengt Sahlm . . . . .	Tecator
James Steele . . . . .	ARS, USGMRL
Cheryl Tew . . . . .	NC Dept of Agriculture
Cliff Watson . . . . .	Consultant
Richard Wothlie . . . . .	Maryland Weights and Measures
Hiro Yamahira . . . . .	Kett Electric

## MEETING SUMMARY

National Type Evaluation Technical Committee  
NIR Wheat Protein Analyzer Sector

March 4-5, 1993

The agenda for the meeting is listed below.

- I. Goals for the Meeting
- II. Handbook 44 Code
- III. Type Evaluation Criteria
- IV. Status of NIR Analyzers Currently Approved by FGIS
- V. Additional Issues Requiring Discussion

## RESULTS AND DISCUSSION

The emphasis of this meeting was placed upon the development of code for an NIR Analyzer chapter in Handbook 44. Sector members recognized that this code must be applicable for existing NIR instruments, and provide clear guidelines for the design of new NIR instruments. It was agreed that the next draft of a Handbook 44 chapter should reflect design requirements directed toward development of state-of-the-art instruments. Once the sector has agreed on these design requirements, we can discuss ways of accommodating existing instruments.

Sector members reviewed proposed revisions to the Grain Moisture Meters code to determine which of these design requirements also should be applied to NIR wheat protein analyzers. Design requirements agreed upon at the initial meeting were also reviewed and compared to proposed requirements for grain moisture meters. Sector members previously recognized that NIR wheat protein analyzers can be separated into two basic categories - those instruments that analyze a ground sample and those that analyze a whole grain sample. Not all design requirements are applicable to both measurement technologies, and Handbook 44 code will need to be developed accordingly.

## II. Handbook 44 Code

Results of the Meeting

Sector members discussed and agreed to the following design requirements for NIR wheat protein analyzers.

1. A minimum sample size of 20 g shall be specified for both ground grain and whole grain NIR instruments.

Comments: Concern was expressed that the sample size specified for moisture meters is unrealistically large for NIR protein analyzers. The 100 g sample size recommendation for moisture meters was based on the variability in moisture content of individual corn kernels. It was noted that the minimum sample size for wheat could be smaller than that for grains having large kernels or seeds. (A subsequent check indicated that a 20 g wheat sample consists of approximately 670 seeds, more than the minimum sample size of 400 seeds specified for grain moisture meters.) It was also agreed that protein variation within a wheat sample probably would be less than the variation in moisture.

2. NIR instruments shall have the capability of providing an audit trail indicating when changes were made in bias, slope, and calibration constants. A written explanation and record of bias and slope changes shall be a user requirement.

Comments: It was agreed that frequent bias checks and adjustments will be required for NIR wheat protein analyzers. This is a marked departure from the approach adopted for moisture meters where slope and bias values are sealed and are not to be adjusted. There are two reasons for this difference in requirements. First, differences

in protein values represent more dollars at the point of sale than a similar difference in moisture content. Second, the moisture bands are larger (10 times?) than those for protein which should reduce the need for frequent moisture bias adjustments.

Physical seals are not a meaningful security measure if frequent bias adjustments are needed. Use of an event counter may not provide meaningful information. One arbitrary change may be inappropriate, whereas weekly bias changes may be appropriate. The situation is further complicated because NIR instruments can be connected into a network where calibrations, slopes and biases can be updated via modem from a central computer. Security measures for NIR instruments are complex and probably will exceed those specified for Category 3 devices in the General Code.

Providing accurate protein results in the field typically requires implementation of an on-going quality control program. Good quality control programs should include documentation verifying that instrument adjustments were made in order to move into closer agreement with the reference method. It was agreed that maintenance of such records should be a user requirement. Concern was expressed that a written log was not a meaningful security measure, that an instrument operator could write down anything they want.

3. Calibrations must be identified by a unique name or version number. Inspectors must be able to recall and verify calibration constants, names, or versions.
4. If calibration constants are digitally stored in an electronically alterable form, the instrument must make automatic calibration checks to detect corruption of calibration constants.
5. The minimum height for the digits used to display protein values shall be 10 mm.
6. An instrument shall not display or record any protein value when the protein level of the grain sample is beyond the operating range of the device, unless the protein representation includes a clear error indication (and recorded error message with the recorded representation).

Comments: A similar requirement was suggested for samples having moisture contents outside the range of moistures represented in the calibration. Protein calibration samples should cover a range of moisture contents in order to more accurately provide wheat protein values adjusted to a constant 12% moisture basis. This issue was not resolved and requires additional discussion.

7. Digital display of protein results is required. Final readout must be in percent protein, adjusted to a constant 12% moisture basis, with no further adjustment of the results required. Conversion charts will not be allowed.

Comments: These items were discussed and resolved at previous meetings.

8. It was agreed that, as with moisture meters, acceptance and maintenance tolerances shall be equal. Five wheat samples (for each wheat class) will be used to check instrument performance in the field. Test samples will be selected such that the difference between protein values obtained using the FGIS standard reference method and an official FGIS NIR wheat protein analyzer shall not exceed 0.3 for individual test samples or 0.15 for the average of 5 samples. Field tolerances shall be 0.6 for individual samples and 0.4 for the average of 5 test samples.

Comments: It was noted that individual states use widely varying tests for moisture meters, and that clear, uniform field test procedures should be established at the start of the new NIR program. Because of the possibility that results obtained on field test samples may be used to make bias adjustments, it was stressed that baseline values established for test samples should agree closely with results obtained by FGIS. It was suggested that protein values established for test samples assembled by the states should be verified by FGIS.

9. NIR instruments shall be equipped with a communication interface that permits interfacing with a recording device. The customer shall be given a printed ticket showing the date, grain type, protein result, and calibration version identification. The ticket shall be generated by the NIR analyzer system.

Comments: Previous concerns related to this requirement were based upon the fact that not all existing instruments have a communications interface. It was agreed that new instruments should have this design feature, and that the

application of this requirement to existing instruments is a separate issue related to phasing in the new program. It was previously agreed that a communication interface should be required to facilitate collection of type evaluation data.

It was clarified that "generated by the NIR analyzer system" does not mean typing information into a computer in order to generate a printed result. The instrument must transmit data directly to a printer or automated accounting system. Concern was expressed that this is an unreasonable requirement for grain elevators and that there would be opposition to such a requirement. A similar requirement for grain moisture meters will be voted on by the NCWM at the July 1993 Annual Meeting.

10. Protein results shall not be displayed or recorded when operating temperature ranges are exceeded. The following minimum temperature ranges were specified.

Whole grain analyzer.

Environmental temperature	- 10 °C to 30 °C
Grain temperature	- 0 °C to 40 °C
Difference between instrument and sample temperature	- 10 °C

Ground grain analyzer.

Environmental temperature	- 10 °C to 30 °C
Grain temperature	- Not applicable
Difference between instrument and sample temperature	- Not applicable

Comments: A wide range in temperatures is unusual for ground grain samples because grinding typically heats the sample. Thus, sample temperature is less of a concern with ground grain samples than it is for whole grain samples.

11. The value of the minimum indicated or recorded protein indication shall not be greater than 0.1 percent. For purposes of type evaluation, the maximum value for the protein indication shall be 0.01 percent.
12. NIR instruments should be capable of indicating the grain type using acceptable abbreviations consisting of up to four characters.

Comments: Some existing meters use a numerical code when selecting calibrations. A decal identifying the calibration represented by each number is attached to the instrument. It was agreed that this arrangement would not meet proposed code or type evaluation requirements. This is an example of where the adoption of Handbook 44 code may have to be phased to accommodate existing instruments.

The following design requirements were previously agreed to by the sector, but were reviewed to ensure that the intent of each requirement was clear.

13. Calibrations must be transferable between different instruments of a given model type.

Comments: Allowable techniques for transferring calibrations have not been specified. It was generally agreed that calibrations developed on a master instrument(s) must be "mathematically" transferable to other instruments. The intent of this requirement is to avoid approval of instrument model types where it is necessary to individually calibrate each instrument within the model type.

14. The operator shall be able to verify either the calibration constants, a unique calibration name, or a unique calibration version on location without the use of an auxiliary computer.



Comments: Previously agreed to wording indicated that the operator should be able to load calibration constants and standardize the instrument on location without the use of an auxiliary computer. Because it is possible to download calibrations from a central computer to instruments in a system or network, it was agreed that the requirement for loading calibration constants should be dropped. The sector did not discuss whether this also applied to other "standardization" information such as slope and bias adjustments. It seems to be generally accepted by members of the sector that operators will need to make on-site wheat protein bias adjustments. Further discussion of this issue is required.

15. Performance requirements shall be met with line voltage variations from 100 to 130 volts at 59.5 to 60.5 cycles per second.
16. It was agreed that warm-up requirements should be similar to those used for grain moisture meters. Requirements for indicating over-temperature conditions should be combined with requirements for warm-up time.
17. Instrument optics and electronics must be protected from exposure to dust by either sealing both areas or by protecting them with a dust filtration system suitable for the removal of airborne dust.

Comments: It was agreed that the requirement that instruments not overheat at 50 percent blockage of the filter within the operating temperature range be dropped. It was felt that identifying when a filter is 50 percent blocked with dust would be an extremely subjective determination.

18. Instruments that must be positioned to within 5 percent (approximately 3°) of an upright normal position to a level plane in order to meet performance specifications shall have a level indicator and leveling adjustments.

Sector members also reviewed Sections S.4, N.1 - N.2, T.1 - T.2, and UR.1 - UR.10 of a draft of a Handbook 44 chapter for Near-Infrared Grain Analyzers. Since most of the suggestions were editorial in nature, they will simply be incorporated into the next draft and not documented in the meeting summary. Recommended procedures for field testing NIR analyzers will be summarized for additional discussion at the next meeting.

### III. Type Evaluation Criteria

#### Results of the Meeting

The sector agreed that basic instrument tests developed for grain moisture meters should be adapted for use in type evaluating NIR wheat protein analyzers. Basic instrument tests include power supply, storage temperature, leveling, warm-up time, humidity, instrument stability, and sample temperature stability.

Comments: The sector discussed whether it was necessary to repeat basic instrument tests for NIR wheat protein analyzer evaluations if similar tests have already been conducted during a grain moisture meter type evaluation. The general feeling was that this would be necessary because tolerances will probably be different and because instrument response might be different for protein than it is for moisture. Depending upon test procedures, it might be possible to use one set of log data for both moisture meter and wheat protein analyzer evaluations. This would not be possible if a different number of subsamples are used for different grain types or different constituents.

### IV. Status of NIR Analyzers Currently Approved by FGIS

This issue was not discussed due to time considerations.

### V. Additional Issues Requiring Discussion

The next meeting for the Grain Moisture Meter and NIR Wheat Protein Analyzer sectors was scheduled for August 17-19, 1993 in Kansas City. A noon-to-noon meeting format was suggested. Items requiring additional discussion at that meeting include:

1. Once a type evaluation program is in place, there are several questions relating to implementation of an on-going standardization program that need to be addressed. What type of quality control program will be put in place? How will standard reference samples be assembled, distributed and used? Could this be done by service companies

already in the business of supplying reference samples? How will the approximately 3000 NIR instruments currently in use be handled?

2. The use of non-NTEP calibrations on NTEP approved NIR wheat protein analyzers needs to be discussed. For example, could a soybean protein and oil calibration be used on an instrument that is NTEP approved for determining wheat protein?
3. Most sector members feel that an on-going calibration program should be required for NIR wheat protein analyzers. Items that need to be discussed and clarified are how this program would be structured, whether participation in the calibration program would be mandatory, and how the program would be funded.

### Participants

March 4-5, 1993

Name	Organization
Jack Barber . . . . .	Dickey-john Corp.
Randy Burns . . . . .	Arkansas Bureau of Standards
Tina Butcher . . . . .	NIST
Allen Butler . . . . .	Perten Instruments
Carol Dickey . . . . .	Bran+Luebbe
Cassie Eigenmann . . . . .	Dickey-john Corp.
Dave Funk . . . . .	USDA/FGIS
Charles Hurburgh . . . . .	Iowa State University
Lowell Hill . . . . .	University of Illinois
Rich Pierce . . . . .	USDA/FGIS
Scott Reed . . . . .	Perten Instruments
Joseph Rothleder . . . . .	California Div of Measurement Standards
Cheryl Tew . . . . .	North Carolina Dept of Agriculture
Cliff Watson . . . . .	Consultant
Richard Wothlie . . . . .	Maryland Weights and Measures

**Summary of the Meeting  
National Type Evaluation Technical Committee  
Moisture Meter and Wheat Protein Technical Sectors  
August 17, 1993  
Kansas City, Missouri**

**MOISTURE METER SECTOR**

1. The code requirement limiting displayed results on NTEP approved meters to NTEP approved attributes was discussed by the sector members. The restriction on test weight was the primary concern. Individual states will have responsibility for monitoring and controlling the displaying of test weight in the field, however, NTEP approval requires a manufacturer's design that allows disabling and sealing of the test weight feature.
2. Displaying of other constituents values was also discussed by the sector. The recommendation that "NIR analyzers that have been NTEP approved as grain moisture meters should be allowed to display constituent values such as protein, oil, and starch." was accepted by consensus.
3. Sector members requested more detail on the check list and test procedures that will be used in moisture meter type approval. The most urgent concern on the part of the manufacturers was the procedure for testing temperature limits. Dr. R. Pierce agreed to develop additional details.
4. Dr. R. Pierce reviewed the anticipated time sequence for type evaluation testing. Part of the time restriction is the approval of NTEP Laboratories. The criteria for use in approving the laboratory are not yet available, but it is anticipated that this decision will be made in the near future. Manufacturers present at the meeting were asked to provide an estimate of the number of meters to be submitted for type evaluation and the approximate date when those submissions would be feasible. The information was treated as confidential and tabulation of the results indicated the possibility of as many as 12 models. Only one manufacturer anticipated submitting before March of 1994. A sample application form was circulated among the committee for comments. Following a brief discussion of items that would be required to be submitted in an application for type evaluation, it was agreed that the manufacturers would look over the application and respond in writing with any changes.
5. A discussion of the sealing and audit trail required on the moisture meter code was followed by a recommendation that a change in wording was required and that change should be as consistent as possible with the recommendation coming from the wheat protein analyzer.
6. There was consensus that any additional changes in the moisture meter code, application forms, or test procedures, should be handled by mail.
7. Previous decisions about testing accessory equipment, such as scales and grinders, in NTEP approval of moisture meters were questioned. The members present had divergent views and interpretations of the previous action by the committee, which was included in the handbook 44 code. Some felt that the device should be entirely operator independent, with weight and grinding internally controlled. Others understood the code to mean that scales and grinders recommended by the manufacturer would be tested for accuracy as part of the NTEP procedures. While everyone agreed that we should encourage manufacturers to go fully automatic, and prohibit an external scale and grinder, the revised code currently does not require that. The cost of the accessory equipment, and the timing and convenience of a fully automated system was thought to be a strong inducement for fully automatic whether or not it was required for NTEP approval. A show of hands was requested for those wanting to change the code to require fully automatic equipment. The vote was 11 to 5 in favor of changing the code. It was ruled that this did not constitute a consensus, the code would be left as written.
8. The Moisture Meter Sector meeting was adjourned on August 18, and the Wheat Protein Analyzer Sector meeting was opened. The following actions were taken by the Wheat Protein Analyzer Sector.

**WHEAT PROTEIN ANALYZER SECTOR**

1. Dave Funk provided an overview of the sources of variation and the difficulty of maintaining consistent comparable results among models, instruments and locations.

2. There was a discussion of the robustness of FGIS samples, both with regard to moisture determination and wheat protein analysis. It was concluded that the NTEP laboratory will seek to maintain as robust a set of samples as cost effectiveness will permit.
3. The committee reviewed the draft code for near infrared grain analyzers item by item. Minor editorial changes in wording were suggested, but the code was essentially approved in its current form by consensus of the committee. The provision in the proposed code requiring a means of security, such as an audit trail, was revised. That section will be reworded and submitted for further consideration by the full committee prior to finalizing handbook 44 code.
4. Dr. R. Pierce identified actions still required for moisture meters; including 1) revision in the handbook 44 code; 2) type evaluation procedures, especially temperature test procedures; 3) distribution of a draft application form; 4) additional information related to publication 14. He agreed to distribute these materials by mail, by September 1, to the sector mailing list for comments.
5. The actions required for wheat protein analyzers included: 1) revision and editing of the handbook 44 code based on the discussion of the sector meeting; 2) distribution of the checklist for testing procedures for type evaluation; 3) developing basic test procedures for NIR analyzers, including accuracy calibrations; 4) a revision in the wording relating to security and audit trails. Dr. R. Pierce agreed that this set of materials could be distributed by mail, by October 1.

Next meeting date and location.

Alternative dates and locations were discussed by the members present. March 27 - 29 or March 28 - 30, were suggested as preferable dates. Dr. Pierce was instructed to identify suitable conference facilities in Las Vegas, Nevada for those dates.

**National Type Evaluation Technical Committee**  
**Moisture Meter Sector**  
**March 28-29, 1994, Las Vegas, NV**  
**Meeting Summary**

**Agenda Items**

- I. Address Industry Concerns Expressed in Letters to the Sector and Others
  1. Cost-Benefit of Recommendations
  2. Adoption of NTEP-Approved Meters by States and by FGIS
  3. Retroactive Dates
  4. Funding of National Calibration Program
  5. Range of Temperatures and Moisture Contents of Commercial Meters
- II. Review Handbook 44 Proposals from S&T Committee Interim Report and other Handbook 44 Issues
  1. 356-1 S.1.2.2. Digital Indications and Recording Elements: Information Sent to Printer
  2. 356-2 S.1.8. Level Indicating Means
  3. 356-3 S.1.10. Operating Temperature; Allowance of 5 °C for Type Evaluation
  4. 356-4 S.2.4. Determination of the Sample Quantity; Use of External Equipment with Grain Moisture Meters
  5. 356-5 S.5.3. Calibration Transfer
  6. 356-6 UR.3.4. Printed Tickets
  7. Audit Trail Requirements (not in S&T Interim Report)
- III. Review NTEP Checklist for Grain Moisture Meters
  1. I. Basic Instrument Tests
  2. II. Sample Temperature Sensitivity
  3. III. Accuracy, Precision, and Reproducibility Requirements

**Meeting Summary**

**I. Address Industry Concerns Expressed in Letters to the Sector and Others**

Included in Appendix A are letter and other documents that express several concerns of device users. The National Grain and Feed Association (NGFA) and the Grain Elevator and Processing Society (GEAPS) have expressed a concern that they are not being heard within the National Conference on Weights and Measures (NCWM) or within the Sector. The Sector discussed how to communicate better with this segment of the weights and measures community. Although user members from the NGFA and GEAPS were not able to attend this meeting, the Sector attempted to address these concerns and will forward the Sector member responses to NGFA and GEAPS with a cover letter from Sector Chairman Dr. Lowell Hill.



### 1. Cost-Benefit of Recommendations

No cost/benefit analysis has been conducted for any recommendation made by the NCWM. Rather than analyses, a consensus for need is sought from affected parties. Sector members present indicated that they had heard very positive comments from individual elevator operators and other users concerning the recommendations of the Sector.

As far as the Sector members understand, the suggestion of a cost/benefit analysis indicates that the user groups represented by the NGFA and GEAPS do not believe that any changes in the commercial grain moisture measurement system are warranted. Other statements by these groups indicate that they question whether the new requirements put into the Handbook 44 Grain Moisture Meter Code will produce greater accuracy in grain moisture measurement.

*The Sector members present agreed that automatic grain moisture meters are not expected to operate any more accurately than nonautomatic devices when compared in a laboratory setting, and operating the devices exactly as described by the meter manufacturer. For nonautomatic devices this includes weighing, taking the temperature, applying test weight per bushel corrections, and looking up meter readings to determine moisture content. However, in real world commercial settings, automatic meters improve the accuracy of the overall grain measurement system by reducing human errors. Non-automatic meters take much more care and time to operate correctly, and, in the interest of reducing measurement times, are often operated so that accurate, consistent measurements are not achieved. Therefore, the Sector members present agreed that there will be a sizeable benefit to shift to automatic devices. Automatic devices significantly reduce the need for external manipulation and, consequently, they reduce human error.*

In addition, the manufacturers present agreed that the resulting cost of automatic meters are not expected to be very much greater than meters available presently that are automatic in operation; these automatic meters are very strong sellers in all segments of the grain trade.

The Sector proposed and the NCWM adopted a reasonable phase-in period (10 years) in order to permit businesses to plan their meter purchases as part of their ordinary equipment improvements and replacements.

### 2. Adoption of NTEP-Approved Meters by States and by FGIS

The importance of uniform State enforcement of the new requirements added to the grain moisture meter code in 1993 was emphasized. Concern was expressed that a leading grain State has threatened not to adopt these requirements. However, the new requirements initially apply only to devices accepted for type evaluation; a 5-year period has been provided in the new code before all commercial devices sold must meet the new code. It will be extremely important for States to have adopted and to begin enforcement uniformly at that point, because of the noncompetitive situations which would exist if uniform enforcement were not in place. Uniform adoption and enforcement of the new requirements is critical in ensuring that the program achieve improved accuracy of grain moisture measurements in the U.S.

Since the NCWM is a voluntary standards development organization, it has traditionally taken a longer time frame to accomplish uniformity among the States in a given area. The NCWM and its members must work towards a faster achievement of uniform adoption and enforcement in this area. The 5-year phase-in should provide the time to plan and implement an enforcement program.

Meter Manufacturers had heard U.S. Department of Agriculture Federal Grain Inspection Service (FGIS) representatives at a national meeting say that FGIS would not be adopting a new meter. FGIS representative, David Funk, clarified that FGIS did intend to replace the official meter with an NTEP-approved device. As a result of discussions, Chairman Hill wrote the FGIS Acting Administrator concerning this issue and received verification that FGIS does intend to adopt a meter or meters that have a National Type Evaluation Program (NTEP) Certificate of Conformance. See Appendix B for copies of this correspondence.

### 3. Retroactive Dates

A concern expressed repeatedly by NGFA, GEAPS, and Sid Colbrook, Illinois Department of Agriculture is their opposition to the requirement that all commercial meters be automatic (meeting the new code) by the year 2003. They would like to remove this date and let the non-automatic meters gradually phase out of commercial use as they become incapable of repair. Some Sector members expressed the belief that the marketplace will take care of itself in time. Others said that small farmer concerns have not replaced their meters in 30 years and were unlikely to do so unless required. *The Sector agreed to delay the 2003 date to make it coincide with the retroactive dates that are proposed for near-infrared protein analyzers.* However,

it was emphasized that no change in the moisture meter dates can be made this July, since no proposal for such a change was included on the NCWM Specifications and Tolerances (S&T) Committee's agenda at the Interim Meeting. In order to provide an opportunity for all interested parties to provide input, a proposal to change the date would have to be refined and presented by Nov. 1, 1994, to the S&T Committee in order to be addressed at the NCWM Interim Meeting of January 1995.

#### 4. Funding of National Calibration Program

Both NGFA and GEAPS have recommended that a national calibration program be delayed until funding can be found for it. Sector members in attendance at the meeting expressed the opposite point of view, that is, that NTEP will not be able to obtain funding for a program that does not exist. The program must be in place to fund. *The Sector members believe that a national calibration program must be planned and executed without delay.*

A national calibration program is the only means to increase accuracy of the grain measurement system and potentially allow the meter tolerances to decrease over time. With a core set of moisture samples with which all meter manufacturers can establish their calibrations, offsetting biases will be reduced. NTEP and the national calibration program provide the only means possible that more than one meter could even be considered by FGIS as an official device.

In the Sector's agenda, three alternatives were listed:

- 1- Proceed with calibration as planned, temporary funding would be needed.
- 2- Waive participation requirements until funding is secured.
- 3- Require minimal calibration check as part of type evaluation, at the expense of the manufacturers.

The concern of manufacturers at the Sector meeting was that if manufacturers paid for the first year of calibration information, they might lose their initial investment if funding for the long term was not found. The Sector agreed that eliminating participation requirements until funding is secured is not technically feasible. The calibration verification is more important than the hardware evaluation in improving the accuracy of grain moisture measurement in the United States.

The Sector agreed that the NCWM needed to pursue federal funding in concert with GEAPS, NGFA, and the National Association of State Departments of Agriculture (NASDA). The problem with delaying NTEP evaluation and the calibration program until federal funding is obtained is that the federal fiscal year begins October 1, 1994. Because of the low dollar cost of operating a national calibration program compared to the costs of other Federal programs, Senator Daschle's staff member, Mr. Tom Buis, has not expressed optimism about the value of raising the issue to the Agriculture Committee. Although an opinion was expressed that NIST could fund this calibration program as a pass-through to FGIS, this was generally dismissed by the Sector. Many sector members think that this program should be an agricultural initiative. At the departmental level of the U.S. Department of Agriculture, the opinion is that this is a NCWM and NIST problem, not a USDA problem. Neither NIST nor USDA nor FGIS is permitted to go to Congress directly seeking funds. Initiatives can be advanced by working levels of each agency but take many months to compete with other worthwhile initiatives and nothing can be forwarded by an individual group without prior approval by all levels of the management chain and the Office of Management and Budget. Each agency is currently working on 1996 initiatives. The U.S. Congress has had the agencies' proposals for 1995 funding (which begins in October 1994) for many months. Another opinion expressed was that the calibration program has a relatively low dollar cost (between \$70,000 and \$125,000 per year for grain moisture meters), and the USDA should be able to find that much for such a worthwhile program. It was suggested that Chairman Hill contact the NCWM Chairman, Tom Geiler and ask that Tom appoint a person to serve as the focal point for the funding issue.

*The Sector agreed that the third option should be implemented as an extension of type evaluation testing prior to participation in the calibration program. More specifically, a calibration should not be listed on the Certificate of Conformance until it has had its calibration bias checked using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter. The cost of the bias check on 13 NTEP grains is estimated at \$1,300 per meter model. The bias check would not eliminate the requirement for participation in the calibration program. The manufacturer has the option of deferring the release of a calibration until after the first year of participation in the calibration program. In that case, an initial bias check would not be required.*

The National Calibration Program is the only way that accuracy can be improved system-wide rather than for any individual meter. Only by providing a date that drives the marketplace to join in that system process, will substantial improvements be realized.

## 5. Range of Temperatures and Moisture Contents of Commercial Meters

NGFA and GEAPS both state that the "maximum allowable moisture meter temperature difference is not operationally feasible nor practically enforceable." The temperature requirements added to the grain moisture meter code in 1993 were developed by consensus. The logic was that grain conditions that are under the operator's control (e.g., temperature) must cause the display to blank if exceeded. When the limited parameters that are not under operator control (e.g., moisture range) are exceeded, the moisture display must be accompanied by a warning. The Sector members commented that meter users have two choices: either to buy a meter with a wider range of capability or change the measurement practices to conform with code restrictions. Each manufacturer will declare the operating limits of his design, including temperature susceptibility, thereby informing the operator of the operational restrictions to maintain measurement accuracy.

The joint letter of March 18 from NGFA and GEAPS to Chairman Hill also questions the limited moisture ranges in the type evaluation protocol as "operationally impractical; particularly during harvest season." Neither the Handbook 44 requirements nor the NTEP evaluation are intended to restrict the range of moisture contents provided by the manufacturer. In fact, 75 percent of U.S. corn (the grain consistently noted with the highest moisture content at time of harvest) comes to the elevator within the range tested during type evaluation. The Sector emphasized that the proposed type evaluation and calibration programs in no way restrict the range of moisture contents declared by the manufacturer. The manufacturer can specify moisture ranges outside of those specified for the type evaluation and calibration programs. Moisture levels outside the limits suspected by the manufacturer can be displayed, but must be accompanied by a warning message.

## II. Review Handbook 44 Proposals from S&T Committee Interim Report

Discussion and consensus positions will be transmitted from the Sector to the NCWM Specifications and Tolerances Committee prior to the NCWM Annual Meeting.

### 1. 356-1 S.1.2.2. Digital Indications and Recording Elements: Information Sent to Printer

This is a clarification requiring date, grain type, moisture, and calibration version to be automatically transmitted. *The Sector agrees with S&T Committee recommendations.*

The Sector notes that the information to be transferred represents a minimum. *Eventually, NTEP should consider proposing that means for automatic data collection for calibration data be required.* One manufacturer's representative stated that if a meter failed the accuracy test, it would be useful to see the raw calibration data, to see whether it was a calibration or other type of problem.

### 2. 356-2 S.1.8. Level Indicating Means

At its last meeting, the Sector agreed that means of leveling may be needed for some moisture meters. In response to input from the Sector, the S&T Committee is proposing incorporating a requirement for appropriate level adjustment mechanism if the meter accuracy is affected by being out of level. In reviewing the S&T proposal, several manufacturer expressed opposition to providing leveling adjustments. One Sector member said that it would be difficult to enforce a level requirement without a level adjustment means, since it is difficult to get users to provide stable leveling means.

*The Sector recommends that the requirement for a leveling adjustment be removed, and place the need to provide a level surface, if necessary, in the user's control. The Sector also recommends that the S&T Committee add a note to clarify that the tolerance requirement to be applied during type evaluation is in Publication 14 and that the Sector recommends that units with level indicators be tested at the limits of the provided level indicator. Units without level indicators will be tested at a 5 percent slope. The Sector recommends that the word "applicable" be inserted before "tolerance requirement" and a footnote to the word "applicable" be added as follows: "Applicable tolerances for type evaluation are specified in Publication 14." The tolerances for type evaluation are much tighter than the tolerances specified in Handbook 44.*

### 3. 356-3 S.1.10. Operating Temperature; Allowance of 5 °C for Type Evaluation

Since this item was withdrawn, no discussion was needed.



#### 4. 356-4 S.2.4. Determination of the Sample Quantity; Use of External Equipment with Grain Moisture Meters

*The Sector agrees that weighing and taking the temperature of the grain should be automatic, in order to avoid any potential human error. The goal is to remove operator interaction that requires particular care to achieve an accurate reading. The meter should not be required to automatically sense when an inappropriately sized sample is offered for analysis but, one might infer from the S&T recommendation that this is required. Most meters would have a great deal of trouble distinguishing between low test weight and an insufficient sample size; therefore, the operator should have to bring a sufficient sample size to the meter to allow the meter to operate. The Sector recommends the following to replace the Committee's recommendation:*

*The moisture meter system shall not require the operator to make a judgement of the precise volume, weight, or temperature required to make an accurate moisture determination. External grinding, weighing, or sample temperature measurement operations are not permitted. (Nonretroactive as of January 1, 1998. To become retroactive as of January 1, 2003.)*

Grinding is a problem because of the moisture loss during grinding and the operation of transferring the ground sample to an appropriate sampling presentation device. The Sector is aware that some operator judgement will be needed, but the specific quantities to be taken to the meter should not be critical to the final accuracy of the moisture determination. There should be fairly broad boundaries in which the meter will still give accurate results. There should be a clear, indication that the required sample amount has not been provided to the meter.

*The Sector also recommends that the text accompanying the recommendation be revised. Modify the last sentence in the third paragraph to read: "While the intent of the NTETC Grain Sector and the NCWM is to more fully automate the process, questions have been raised concerning whether or not the language adopted in July 1993 actually achieve this goal, particularly related to the weighing or temperature measurement of the grain sample." The Sector agreed that external temperature measurement (including the operator placing an attached probe in the sample) should not be allowed, because of the possibility of the operator neglecting to place the probe in the sample. The Sector also recommends modifying the last two sentence in the fourth paragraph as follows: "This requirement allows the operator to add a sufficient amount of grain to the moisture meter to permit the measurement to be made but does not require the operator to measure a precise amount of grain, not to require that a precise amount of grain must be measured into the meter. "When a sufficient amount of grain has been added, the meter must automatically extract the portion of the grain needed for the moisture determination."*

#### 5. 356-5 S.5.3. Calibration Transfer

The recommendation derives from requirements for near-infrared devices that are intended as moisture meters. The intent is to test a device and have some guarantee that others will perform the same way.

In the course of reviewing this item, the Sector discussed the issue of making calibration changes to devices in the field. (See also the additional discussion under III. 3. Accuracy, Precision, and Reproducibility Requirements). Both discussions may suggest the need for additions to the Handbook 44 code.

One meter manufacturer representative asked that instrument calibration updates or biases be allowed during the harvest season. This would allow updates in a crop year to reflect a more robust sample set. This prompted the question of whether or not changes in bias could be made to a device knowing that this would create differences between this device and others (that is, moving that device away from other devices in performance results). However, Sector members noted that if one device is already not reading in the same range as other devices, the natural tendency would be to adjust the device to bring it within the readings of the other devices. The Sector had previously discussed the possibility of establishing a subcommittee to evaluate proposals and data to make changes. The Sector recognized the need to carefully evaluate changes which would make the performance of one meter different from others. One Sector member noted that there are two different technologies being discussed as moisture meters: a single variate (dielectric) meter and a multivariate (near infrared transmission, (NIRT)) meter. Another manufacturer's representative questioned the validity of permitting updates, suggesting that the need for frequent updates might indicate a technology that is not ready for a commercial environment. Another suggested that if a manufacturer can provide data to demonstrate that changes are warranted and the changes would bring the results more in line with other devices, then the Sector should permit such changes. If the changes would take the meter farther from other models, then the changes should not be permitted. Another commented that pre-screening a set of test grain samples on a dielectric meter will not necessarily adequately pre-screen grain for reasonable prediction on an NIR device. *The Sector concluded that, except in rare instances, changes to the calibration bias and slopes must be justified and reviewed by the Sector or a subcommittee under the Sector.*

*It was the consensus of the Sector that only the manufacturer or his designated service agency shall make calibration transfer adjustments on moisture meters and, except for instrument failure and repair, only at a prescribed period of time during the year. This will not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instruction of the manufacturer or his authorized agent.*

*The Sector proposes that the "most recent calibration" includes the "most recent standardization parameters" specified by the manufacturer for the device. The Sector also asks the S&T Committee to consider proposing a requirement for the owner of the instrument to maintain documentation showing that the standardization parameters in the device are those specified by the manufacturer or designated service agency and to make this documentation available for inspection by enforcement personnel.*

The conditions that should apply to calibration updates during this first year of NTEP grain moisture meter evaluation were discussed. Calibrations for pending grains may have to be installed in new NTEP meters this year even though the calibrations may not be ready at the time that the devices are type evaluated. It was concluded that manufacturers do not have to provide supporting data for pending calibrations for NTEP grains during the first year of the program, but they must provide data for the three NTEP grains to support calibration outside of the range tested by NTEP. Pending calibrations may be developed and installed during this first year. The device is not required to display the status of the calibration.

Sector members also noted that there needs to be established a national program for standardizing air ovens. In the meantime, it is very important that States contribute grain samples to FGIS so that a truly national sample set can be constructed.

David Funk, FGIS, reported that under the proposed Calibration Maintenance and Review program, FGIS intended to supply manufacturers with meter vs. air-oven data, raw meter data, and the following data processing output: scatter plot of meter vs. air-oven, bar charts of bias in 2% intervals, confidence limits for each 2% interval, and comparison of meter error vs. absolute limits. Manufacturers expressed interest in obtaining access to the FGIS SAS software program to duplicate the data analyses after calibration updates. FGIS will provide this software for the cost of reproduction. This will allow manufacturers to use calibration data other than that collected as part of the NTEP program. Calibration data collection instruments will need to be checked against manufacturers' standard instruments at least annually.

For specialty subsets of NTEP grains, such as high-oil corn, the manufacturer may install special calibrations. It must be clear when the special calibrations are to be applied. The installation of the special calibrations must be coordinated through the manufacturer. It was noted that non-NTEP grains are to be addressed by individual weights and measures jurisdictions.

#### **6. 356-6 UR.3.4. Printed Tickets**

*The Sector maintains its position on this issue and agrees with the S&T Committee that insufficient evidence has been provided for dropping the requirement for a printed ticket. Since grain moisture meters are not typically positioned or located to enable the customer to easily observe the indications, the printed ticket provides the basic transaction information to the customer.*

#### **7. Audit Trail Requirements**

*The Sector recommends adoption of requirements for sealing and audit trails for moisture meters identical to those proposed for NIR grain analyzers:*

##### *S.2.3. Provision for Sealing. -*

- a. Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.*
- b. If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and 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 (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants.)

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) 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.)*

### III. Review NTEP Checklist for Grain Moisture Meters

The following items refer to NCWM Publication 14, Grain Moisture Meters Code, dated March 22, 1994. The Sector reviewed this draft and made the following corrections to reflect changes previously agreed to by Sector members that inadvertently did not get incorporated into the test procedures.

#### 1. I. Basic Instrument Tests

*Power Interruption. The Sector agreed that NTEP shall tentatively apply a 1 second interruption during the measurement cycle. No moisture content should print or display under a complete power interruption. Manufacturers agreed to check their instruments and let Dr. Pierce know whether or not the proposed 1 second interruption is acceptable. The Sector agreed that insufficient data was available to specify a realistic test for radio frequency interference testing be deferred until such data becomes available. The effect(s) of radio frequency interference on meter performance depends heavily on field conditions and influences present in the actual installation; however, a meter will probably behave the same in the laboratory as in the field when subjected to a power interruption.*

The Sector also discussed the time required for initial Phase I type evaluation testing. Dr. Pierce indicated that he expects a period of about 4 to 6 weeks for the testing cycle.

#### 2. II. Sample Temperature Sensitivity

*The Sector agreed to change the description of temperature test tolerances to apply to the difference in readings between room temperature  $\pm$  delta T, where delta T is a minimum of 10 °C but may be a wider manufacturer-specified temperature difference. Changes will also be made in the test procedure to reflect the procedures the Sector had agreed upon in October 1992. The tolerances established by the moisture meter subcommittee (and endorsed by the Sector) were based on referring "hot" and "cold" results back to room temperature. Before correction, the procedures applied this tolerance to the overall change between "hot" and "cold" results.*

The agreed upon procedure reads:

#### II. Sample Temperature Sensitivity

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is 10 °C (or at a larger, manufacturer specified, difference). The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature  $\pm$  10 °C T to room temperature - 10 °C T.

Two (2) samples will be selected from each of three 2% moisture intervals for each of the three grains - corn, HRW wheat, and soybeans. Three analyses will be made for each grain sample at ~~both the hot and cold temperature extremes, and the~~ each of the three test temperatures. The overall bias for the 18 observations (2 samples x 3 moisture intervals x 3 replicates) run at ~~each the~~ temperature extremes must agree with the room temperature results within the following tolerances:

Corn	0.45
Wheat	0.35
Soybeans	0.35

## Test Procedure:

1. Analyze the room temperature samples on the test instruments (Room 1).
2. Condition samples to the cold temperature and run according to the test procedures outlined earlier, i.e., recondition to the cold temperature after each analyses and alternate tests between the two instruments (Cold).
3. Bring the samples to room temperature, and run the samples on the test instruments (Room 2).
4. Condition the samples to the hot temperature and run on the instruments (Hot).
5. Repeat step 3 to obtain another set of room temperature results (Room 3).

$$\text{COLD BIAS} = \text{Cold} - ((\text{Room 1} + \text{Room 2}) / 2)$$

$$\text{HOT BIAS} = \text{Hot} - ((\text{Room 2} + \text{Room 3}) / 2)$$

The value of running air oven tests on the samples was questioned because of the expense. It was contended that if the meter fails temperature tests, NTEP would not use the air oven results to validate the results. Dr. Pierce responded that if a manufacturer challenges NTEP results and there is no air oven to back up NTEP findings, NTEP would be forced to repeat the tests at NTEP expense. Two Sector members reminded the others that NTEP must do the air oven tests before and after the power supply tests; otherwise one could not confirm that the results of the power supply test are a result of variation in power supply or a result of changes in the moisture of the sample. Several members expressed opposition to using reference meters to determine the moisture content. *The consensus reached is that NTEP does not need air oven results for the sample temperature sensitivity tests, since the meter should not be changed or altered by this test.*

### 3. III. Accuracy, Precision, and Reproducibility Requirements

The Sector emphasized that moisture meters should be stable enough to maintain calibrations throughout the year. However, it was noted that the manufacturer may have to fine tune the calibrations at the time of submitting the device for type evaluation. The calibration and standardization of devices so that they all match each other is done by the manufacturer, not the user. However, this principle may be a problem to realize for near infrared transmission (NIRT) devices, since each device will be slightly different based on the spectral analysis as seen by each device. Sector members question how a field official will tell that adjustments that have been done are correct. The audit trail will only tell the inspector that something has been done, but not whether the adjustments were correct. Since each device must be customized, a network is necessary to manage the adjustments, and the user may need to part of the network.

For NIRT devices used as moisture meters, a secondary adjustment is required beyond initial standardization. When an inspector tests a NIR device and it fails, a repair person could repair it by performing a slope and bias adjustment. At the present time, these devices are designed so that the user is expected to do these adjustments on a regular basis whenever they appear to be needed. The Sector members were asked whether or not user adjustments such as these should be permitted. If the user must perform adjustments on a regular basis, the question arose of whether or not the requirement for the audit trail could be modified to enable the adjustments to be tracked. This would provide an inspector with the means to determine if the adjustments were appropriate. Present requirements for audit trails would not provide this information; however, they do allow the inspector to detect whether or not changes had been made.

Another problem is that if an inspector checks with one set of samples, the user might think that he must adjust to that set. If the inspector comes back with another set of samples, the user again might be inclined to adjust to match that second set of samples. NIR device users should not make adjustments just to match a set of moisture samples. Adjustment should be made using standard sets of samples to determine the specific spectral slope and bias for that individual device. The adjustments should be such that they will pull meter results toward all other meters.

The basic calibration will be the same for each instrument within an NTR model line, but individual instruments may be equipped with unique slope and bias values or even unique calibration constants reflecting standardization adjustments. With remote access and remote diagnostics now available, the manufacturer can standardize the device over the phone and have the audit trail reflect that operation. (However, NTEP is not really evaluating the calibration unless it is evaluating the device with a given bias and slope set.) Each year, if the calibration is changed, each device must be adjusted to set a new slope and bias based on that new calibration and stored spectral data analysis. A decision that must be made is what are the limits

of what the user is allowed to do and what can only the manufacturer do. One possibility is that the standardization process may require devices to be standardized at a central location.

These rules would not apply to devices for which standardization parameters are not downloaded and for which no audit trail applies (e.g., for dielectric devices or if the NIR device is physically sealed for the year of operation).

### **Calibrations**

When issued, the Certificate of Conformance (CC) will declare that certain grain calibrations are "pending." The meter must pass tests on the three major grains in order to qualify for Phase II, the National Calibration Program. For grains other than the three NTEP grains, except for the first year of the program, the manufacturer must submit data but the calibrations don't have to be loaded in the device at the time of type evaluation. During the first year of the program, manufacturers do not have to provide supporting data, but an initial bias check by the NTEP lab will be required before pending calibrations could be added to the Certificate of Conformance and used commercially. The justification for not requiring data is that these calibrations were already being used commercially. To promote the goal of uniformity, manufacturers conceded that an initial bias check (and adjustment if necessary) should be required before pending calibration were listed on the Certificate. However in future program years, pending calibrations will only be recognized if data is provided.

For corn, hard red winter wheat, and soybeans, a 6% moisture range must be supplied and verified. The manufacturer must supply data to support the remainder of the calibration range. The manufacturer does not have to provide supporting data for pending grain calibrations at the time of submission of his device this first year, and the pending calibrations may be installed at any time during the year (assuming data has been submitted to NTEP at this later time). Manufacturers will pay for the initial bias check for all pending calibrations prior to commercial use; initial estimates for this are \$100/calibration check. The cost will be higher for devices requiring more test effort. The manufacturer may opt to wait until FGIS has collected a year's data before issuing a pending calibration; however, the pending calibration cannot be used commercially in the meantime. For specialty subsets of NTEP grains, such as high-oil corn, the manufacturer may install special calibrations. Clear instructions must be provided specifying when the special calibrations are to be used. In submitting an application for type approval, the manufacturer must mark those grains on the NTEP list for which the device will never be used as "not available." The instrument display is not required to provide the status of the calibration.

### **Next Meeting**

The next meeting of the Sector is planned for September 21-23, from 8 am Wednesday to noon Friday at the Embassy Suites at LaClede's Landing, in St. Louis, MO. A sequence of meetings are planned on a regular basis in March and in September of each year.

June 14, 1994

**National Type Evaluation Technical Committee**  
**Near Infrared Grain Analyzer Sector**  
 March 29-30, 1994, Las Vegas, NV  
 Meeting Summary

**Agenda Items****I. Review Handbook 44 Proposed Tentative Code from S&T Committee Interim Report**

1. S.1.2. Selecting Grain Class and Constituent.

2. N.1.1. Field Inspection

**II. Review Type Evaluation Test Procedures and Tolerances**

1. I. Basic Instrument Tests

2. II. Accuracy, Precision, and Reproducibility Requirements

**III. National Calibration Program****I. Review Handbook 44 Proposed Tentative Code from S&T Committee Interim Report**

1. S.1.2. Selecting Grain Class and Constituent.

*The Sector recommends the following revision of S.1.2.:*

Provision shall be made for selecting, displaying, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituent(s) selected shall be clearly and definitely identified in letters (~~such as HRWW, HRSW, etc. or PROT, etc.~~) or numbers. The use of a number to select and display the class or type of grain and constituent(s) is permitted provided that the number is clearly defined adjacent to the display.

The following minimum letter abbreviations may be used. Longer than four-letter abbreviations are also permitted:

<u>Durum Wheat</u>	<u>DURW</u>
<u>Hard Red Spring Wheat</u>	<u>HRSW</u>
<u>Hard Red Winter Wheat</u>	<u>HRWW</u>
<u>Soft Red Winter Wheat</u>	<u>SRWW</u>
<u>Soft White Wheat</u>	<u>SWW</u>
<u>Hard White Wheat</u>	<u>HDWW</u>

This recommendation will allow the use of a product/constituent number with a front-panel placard showing the corresponding calibration/constituent names. When abbreviations are used, a minimum of four letters, except for soft winter wheat, are required, but the Sector recommends that longer abbreviations be permitted.

2. N.1.1. Field Inspection

*The Sector recommends the second paragraph be revised:*

Constituent Wheat protein values shall be assigned to test samples by the Federal Grain Inspection Services (FGIS).



*In addition, the Sector recommends that N.1. be organized so that other grains and constituents may be added at a later date. For example, NIR is being used to test the oil content of soybeans. For example:*

**N.1.1. Field Inspection.** - Whole grain samples shall be used as the official field inspection standards. Five samples per grain type or class shall be used to check instrument performance. Each sample will be analyzed once. One of the samples will be analyzed an additional four times to test instrument repeatability. For ground grain instruments, the ground sample will be repacked four times. A new grind is not required.

~~Wheat protein values shall be assigned to test samples by the Federal Grain Inspection Service (FGIS).~~ Tolerances shall be applied to individual sample measurement, the average of individual measurements on each of the five test samples, and the maximum difference (range) in results for five analyses on one of the test samples.

**N.1.2. Standard Reference Samples.** -

**N.1.2.1. Wheat.** - Reference samples used for field inspection purposes shall be clean and selected to reasonable represent the constituent range. ~~Wheat protein values shall be assigned to test samples by the Federal Grain Inspection Service (FGIS).~~ These samples shall be selected such that the difference between wheat protein values obtained using the FGIS standard reference method and an official FGIS NIR wheat protein analyzer does not exceed 0.3 for individual test samples or 0.15 for the average of 5 samples.

Wheat protein values for standard reference samples will be assigned by FGIS chemical reference laboratory to make the commercial and official systems equivalent to each other.

## II. Review Type Evaluation Test Procedures and Tolerances

### 1. I. Basic Instrument Tests

**Power Supply.** *Because these devices are used in more controlled environments than are the moisture meter, change the type evaluation power supply range from 105 to 129 V. If a device is submitted for evaluation as both a moisture meter and a protein analyzer, the more stringent requirements for grain moisture meters (100 to 130 V) must be met.*

*During the power supply tests, the test should be conducted so as to minimize the sample presentation differences, for example, using sealed cells for ground-grain devices. The Sector also decided to use 10 analyses at each supply voltage level, and apply a tolerance on the bias and standard deviation of 0.10% protein.*

**Storage Temperature.** *The Sector decided that it is important to minimize sample presentation differences by careful sample handling. Revise the last sentence under Storage Temperature as follows:*

The maximum bias shift allowed for the average of 10 ~~drops~~ sample analyses before and after temperature cycling is 0.20% protein.

**Leveling.** *The Sector decided that if a level indicator is provided, the device will be tested at the indicated limits of the level indicator rather than at a slope of 5%. There will be 10 tests at each orientation using a HRW sample. (This was the position taken by the Sector with respect to moisture meters.)*

**Retests.** *If a model fails a test, the manufacturer has the option to request a re-test (at additional cost) after correcting the fault that caused the model to fail. The type evaluation laboratory has the option to perform additional testing if there is reason to believe that a model does not meet the intent of the specifications. If the manufacturer changes a calibration due to a failure during the tests, all tests involving the obsolete calibration may be repeated at the discretion of the type evaluation laboratory. The type evaluation laboratory may collect and provide spectral data during basic device tests or accuracy tests if the collection does not significantly impact the performance of the tests. Repredictions of collected spectral data will not be accepted as evidence of passing a test.*

**Warm-Up Time.** *The warm-up time is not necessarily a fixed time interval, but may be defined by a warm-up indication. The Sector decided that retest after warm-up will be at a minimum of 1 hour after the specified warm-up time or warm-up indication appears.*



**Instrument Stability.** *The Sector decided that these tests should use sealed samples if possible, over the ranges of 10-12% ("low"), 12-14% ("medium"), and 14-16% ("high") protein levels. The tolerance will be reviewed when data is available to determine whether 0.20% protein is appropriate.*

**Instrument Temperature Sensitivity:** *The Sector decided that the same protein levels of samples for instrument stability would be used for instrument temperature sensitivity, also using the most stable practicable sample presentation (sealed samples if possible). The samples themselves must be a different set for the instrument temperature sensitivity test than for the instrument stability and other tests where the sample temperature is not cycled. The Sector decided to eliminate the requirement to split the sample into three portions. The Sector agreed to a tolerance of 0.35% protein from the average protein content at 22 °C.*

*As a clarification for marking, the ambient temperature range does not have to be marked on the device, but must be provided in the operating instructions.*

**Sample Temperature Sensitivity.** *The Sector agreed that the test protocol should be the same as specified for moisture tests: Use a high (13-14%) and low (10-11%) moisture sample for each of the three protein ranges (10-12, 12-14, and 14-16% protein). Evaluate the biases for the high moisture set and low moisture set separately. The sample temperature sensitivity test does not apply to ground grain devices because the grinding process effectively equilibrates the sample temperature to the room temperature.*

*The Sector will communicate with the Specifications and Tolerances Committee concerning basic device tests, including humidity, device stability, and storage temperature, that have been devised to determine General Code conformance with requirements for permanence and suitability for the operating environment. These tests are not specifically part of the proposed code. The requirements could be placed in Handbook 44 with a note that they should be performed in a laboratory only under controlled conditions. At the present time, the requirements are incorporated in Publication 14. The Sector is aware that uniformity in test requirements needs to be maintained. The philosophy of what is required as a part of the code to warrant type evaluation tests needs further clarification.*

## 2. II. Accuracy, Precision, and Reproducibility Requirements

The question of whether the number of samples could be reduced from 50 to 25 was considered. Using 25 samples would require some pre-selection of the samples, taking time and effort. Fifty randomly selected samples would not require that much more time. Unlike moisture content varying with exposure to the environment, protein content in the samples will not vary. Both protein and moisture ranges will be from the sample stock, with moisture varying from 8 to 15%. A recommended protein test range for each wheat class will be developed. Slope set range or FGIS calibration range for HRWW; HRSW; DURW; SWW; HDWH; and SRWW.

**Repeatability.** *Calculated values will be pooled within each wheat class: Revise first sentence: The Standard Deviation (SD) of the three replicates of each 2% protein interval will be calculated for each sample in a 2% moisture interval and will be pooled across samples for each class. Also revise the statements of tolerance values: Specifically, the tolerance is 0.15 for all classes each class of wheat. Also: Specifically, the tolerance is 0.20 for all classes each class of wheat.*

## III. National Calibration Program

The question of whether an annual calibration data collection or calibration checks were needed for wheat protein analyzers was explored. FGIS doesn't operate the same kind of program for protein as for moisture where 3-5 years of data are used in a calibration analysis. FGIS currently reviews the data every 2-3 years and updates the calibration for a more robust calibration. Manufacturers could use the annual calibration data supplied by FGIS to justify calibration changes. Whole grain moistures for whole grain instruments would be a major part of program costs. It would be much simpler to deal with moisture-basis-corrected protein values only.

One manufacturer said that there is a real need for a centralized source of slope samples. A common set of slope samples to standardize devices may be more significant that calibration updates. There should be a sufficient amount of samples available for slope and bias calibrations. However, there is a need for validating new calibrations as well.

FGIS noted that standardization charges are already being billed to individual users, they are paying for the adjustment to individual instruments on an instrument-by-instrument basis.

Executive Committee

The Sector questioned when type evaluation testing could begin if the NCWM adopted the proposed code as tentative at the NCWM Annual Meeting. Some manufacturers are anxious to begin and others are not. FGIS expects to be able to start testing shortly after the proposed code is adopted. FIGS will need to be authorized to conduct NTEP tests and will need to assemble test samples. The Sector will need to review test procedures at the next meeting.

Meeting Attendees	
Name	Affiliation
Rich Pierce	Federal Grain Inspection Service (FGIS)
Lowell Hill	University of Illinois
Robert D. Wittenberger	Missouri Weights and Measures
Randy Burns	Arkansas Bureau of Standards
Cheryl Tew	North Carolina Dept. of Ag. Standards Division
Rich Flaugh	GSF, Inc.
Chuck Lowden	Foss Food Tech.
Russ Tkachuk	Canadian Grain Commission
Cassie Eigenmann	Dickey-john Corp.
David Funk	FGIS
Hugh Shown	Dickey-john Corp.
Jack Barber	JB Associates (for Dickey-john Corp.)
Pontus Nobreus	Perstorp/Tecator
Hiro Yanahira	Kett Electric
Cliff Watson	Consultant
Will Wothlie	Maryland Weights and Measures
Allison Pflug	CSC Scientific Co
Michael van den Matten	Sinar Technology
Tina Butcher	National Institute of Standards and Technology
Dominique LeGigan	Star Partners
Jeff Martin	Steinlite Corp
Joseph Rothleder	California Department of Agriculture
Sid Colbrook	Illinois Department of Agriculture
Charles Hurburgh	Iowa State University

## Final Report of the Laws and Regulations Committee

Barbara J. Bloch, Chairman  
Special Assistant  
California Division of Measurement Standards

Reference  
Key Number

### 200 Introduction

This is the Final Report of the Laws and Regulations Committee for the 79th Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the Conference "Program and Committee Reports" (NCWM Publication 16), the Addendum Sheets issued at the Annual Meeting, and actions taken by the membership at the Voting Session of the Annual Meeting.

Table A identifies the items in the Report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Interim Meeting Agenda. Voting items are indicated with a "V" after the item number. Consent calendar items are marked with a "VC." Items marked with an "I" after the reference key number are information items. The items marked with a "W" were withdrawn by the Committee. Items marked with a "W" generally will be referred back to the regional weights and measures associations because they either need additional development, analysis, and input, or did not have sufficient support of the Committee to bring them before the NCWM. Table B identifies appendices A-G, and Table C shows the voting results from the 79th NCWM. Revisions proposed by the Laws and Regulations Committee are shown in **bold face print** by ~~crossing out~~ what is to be deleted and underlining what is to be added. New items are designated as such and shown in **bold face print**. Proposals presented for information are shown in *italic type* unless otherwise identified as informational. This Report contains recommendations to revise or amend National Institute of Standards and Technology (NIST) Handbook 130, 1993 edition, "Uniform Laws and Regulations," or NIST Handbook 133, "Checking the Net Contents of Packaged Goods," Third Edition and Supplements 1 (1990), 2 (1991), and 3 (1992). "SI" means the International System of Units. "FPLA" means the Federal Fair Packaging and Labeling Act. The section mark, "§," is used in most references to sections in the text and is followed by the section number and title, (for example, § 1.2. Weight.). The term "weight" appears in this report due to common commercial usage; it here means "mass."

### Subject Series

Handbook 130 - General	210 Series
Uniform Laws	220 Series
Weights and Measures Law (WML)	221 Series
Weighmaster Law (WL)	222 Series
Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law (EFIL)	223 Series
Uniform Regulations	230 Series
Packaging and Labeling Regulation (PLR)	231 Series
Method of Sale of Commodities Regulation (MSCR)	232 Series
Unit Pricing Regulation (UPR)	233 Series
Voluntary Registration of Servicepersons and Service Agencies for Commercial Weighing and Measuring Devices (VRSR)	234 Series
Open Dating Regulation (ODR)	235 Series
National Type Evaluation Regulation (NTER)	236 Series
Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Regulation (EFR)	237 Series
Interpretations and Guidelines	238 Series
Price Verification	239 Series
NIST Handbook 133 - General	250 Series

**Table A**  
**Index to Reference Key Items**

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<b>210</b>	<b>NIST Handbook 130 - General</b>	211
210-1 I	Ensuring that the UPLR is Identical to Federal Regulations	211
<b>223</b>	<b>Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law</b>	211
223-1 I	Revisions to the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law	211
<b>232</b>	<b>Uniform Regulation for the Method of Sale of Commodities</b>	211
232-1 V	§ 1.3. Butter, Oleomargarine, Margarine, etc. - Eliminate Size Restrictions	211
232-2 V	§ 1.4. Flour, Corn Meal, and Hominy Grits - Eliminate Size Restrictions	212
232-3 I	§ 1.6. Fluid Milk Products and § 1.7. Other Milk Products - Eliminate Size Restrictions	212
232-4 V	Compressed Natural Gas When Sold as an Engine Fuel	213
232-5 I	Standardized Size Descriptions for Shrimp	217
232-6 VC	Basis Weight for Communication Paper	217
232-7 I	3.3. Machine-Vended Commodities	219
<b>236</b>	<b>Uniform National Type Evaluation Regulation</b>	220
236-1 I	Revisions to the Uniform National Type Evaluation Regulation	220
<b>237</b>	<b>Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation</b>	220
237-1 V	Fuel Quality Standard for Natural Gas	220
237-2 I	Revisions to the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation	220
<b>238</b>	<b>NIST Handbook 130 - Interpretations and Guidelines</b>	221
238-1 VC	Revisions to § 2.6.6. Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory	221
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<b>240</b>	<b>Price Verification</b>	221
240-1 I	Examination Procedure for Price Verification	221

**Table A (Continued)**

Reference Key No.	Title of Item	Page
<b>250</b>	<b>NIST Handbook 133</b>	<b>222</b>
250-1 V	Revisions to NIST Handbook 133	222
250-2 I	Moisture Loss for Pasta	225
250-3 I	Moisture Loss for Rice	225
250-4 VC	Aerosol Products -- Test Allowance for Foam Products	225
250-5 I	Gray Areas for Meat and Poultry Products	226

**Table B  
Appendices**

Appendix	Title	Reference Key No.	Page
Appendix A:	Draft of a Revised Uniform Regulation for National Type Evaluation	236-1	227
Appendix B:	Report of the Petroleum Subcommittee to the Laws and Regulations Committee	223-1 & 237-2	232
Appendix C:	Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law	223-1	240
Appendix D:	Uniform Regulation for Engine Fuels, Petroleum Products, and Automotive Lubricants	237-2	243
Appendix E:	Recommendations for a Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory	238-1	251
Appendix F:	Third Draft - Examination Procedures for Price Verification	240-1	259
Appendix G:	2.6.8. Commodities Under FTC Jurisdiction Under the FPLA and Exclusions	238-2	294



**Table C**  
**Voting Results**

Reference Key No.	House of State Representatives		House of Delegates		Results
	Yes	No	Yes	No	
200 (Consent Calendar)	41	0	56	0	Passed
232-1	38	4	47	8	Passed
232-2	38	4	54	9	Passed
232-4	38	4	39	13	Passed
250-1	43	0	53	1	Passed
200 (in entirety)	43	0	60	0	Passed
237-1	41	0	54	0	Passed



information declared on the package to perform value comparisons. The American Butter Institute and the National Association of Margarine Manufacturers support the Committee recommendation.

**Committee Recommendation:** Remove the size restrictions from § 1.3., but retain the method of sale by weight.

**1.3. Butter, Oleomargarine, Margarine, Butter-Like and/or Margarine-Like Spreads.** -- Shall be offered and exposed for sale and sold by weight, ~~per § 1.3.(a) or § 1.3.(b).~~

~~(a) SI Masses 125 grams, 250 grams, 500 grams, 750 grams, or a multiple of 500 grams.~~

~~(b) Inch-Pound Weights 1/4 pound, 1/2 pound, 1 pound, 1 1/2 pounds, or a multiple of 1 pound.~~

"Butter-like and/or margarine-like spreads" are those products that meet the Federal Standard of Identity for butter or margarine and oleomargarine except that they contain less than 80% fat and may contain other safe and suitable ingredients.

**232-2 V § 1.4. Flour, Corn Meal, and Hominy Grits - Eliminate Size Restrictions**

(This item was adopted.)

**Background:** The Western Weights and Measures Association (WWMA) recommended that the size restrictions in § 1.4. Flour, Corn Meal, and Hominy Grits be eliminated. The WWMA requested the action because the current requirements do not allow industry to respond to consumer preferences. The Committee recommends that the size restrictions for these products be eliminated for the same reasons listed in 232-1.

**Committee Recommendation:** Remove the size restrictions from § 1.4. and retain the method of sale by weight.

**1.4. Flour, Corn Meal, and Hominy Grits.** -- Wheat flour, whole wheat flour, graham flour, self-rising wheat flour, phosphated wheat flour, bromated flour, corn flour, corn meal, and hominy grits, whether enriched or not, shall be packaged, kept, offered, or exposed for sale, or sold ~~only in by weights, per § 1.4.(a) or § 1.4.(b), provided SI sizes less than 1 kilogram or more than 50 kilograms and that inch-pound sizes less than 2 pounds or more than 100 pounds and shall be permitted.~~

~~(a) SI Masses 1, 2.5, 5, 10, 25, or 50 kilograms.~~

~~(b) Inch-Pound Weights 2, 5, 10, 25, 50, or 100 pounds.~~

**232-3 I § 1.6. Fluid Milk Products and § 1.7. Other Milk Products - Eliminate Size Restrictions**

**Background:** The Western Weights and Measures Association recommended that the size restrictions contained in § 1.6. Fluid Milk Products and § 1.7. Other Milk Products be eliminated. This recommendation is based on the same reasons listed above in item 232-1. At the Interim Meeting, a representative of the International Dairy Foods Association (IDFA), which includes the Milk Industry Foundation and the International Ice Cream Association, requested that action on this agenda item be delayed until the Interim Meetings in January 1995. This delay was requested to allow for a thorough industry-wide analysis of the issue.

The issue of eliminating package size requirements for dairy products is of great interest to the member companies of the IDFA. The industry has operated within these parameters for many years and, as a result, has achieved substantial uniformity within the marketplace. The dairy industry believes that the system of standardized package sizes has assisted consumers not only in terms of value comparisons, but also in terms of familiarity of product use in home food preparation, recipes, and portioning for consumption. In addition, uniformity in package sizes helps to control costs to

consumers by restricting capital expenditures for processors in terms of the additions or adjustments to processing, packaging, and distribution equipment which would be necessary to accommodate additional package size offerings.

Such uniformity has not come without a price tag, however, and that price tag is largely a limitation on consumer choices. Consumers have not experienced the potential benefits of unrestricted package size selection for milk and ice cream products. The industry is also aware that, for the most part, unit pricing "eliminates the need to limit sizes" to assist consumers in making value comparisons and also recognizes that competitive food products are not subject to similar restrictions. Finally, some members of the IDFA believe that the elimination of the package size requirements could enable their products to compete more effectively within the marketplace. The Committee agrees that a complete analysis of the issue should be conducted within a one-year time frame and the results of the study presented for review and deliberation at the Interim Meeting in January 1995. Comments on this proposal are solicited from consumer, trade groups, and other interested parties.

## 232-4 V Compressed Natural Gas When Sold as an Engine Fuel

(This item was adopted.)

**Background:** This item was carried over from the 78th NCWM L&R Report. (See 232-7 on page 229 in the Report of the 78th NCWM.) Following the NCWM Annual Meeting in Kansas City, Missouri, a Working Group was established to develop a method of sale for compressed natural gas (CNG) sold at retail as an engine fuel. The Working Group is made up of weights and measures officials from Maryland, North Carolina, and West Virginia and representatives of the U.S. Department of Energy, automobile manufacturers, natural gas distribution companies, CNG dispenser manufacturers, CNG station operators, the Natural Gas Vehicle Coalition, the American Automobile Association, the Society of Independent Gasoline Marketers of America, Amoco, Conoco, and the American Petroleum Institute (API). The CNG Working Group's recommendations to the NCWM Laws and Regulations Committee are shown in *italics*.

### Background

The CNG Working Group considered the following factors in its discussions of this issue: (1) precedent in previous NCWM actions or decisions; (2) the need to ensure fair competition among companies; (3) potential for intentional and accidental errors; (4) variations in energy content of fuels; (5) applicability of the requirements to other fuels; and (6) recognition of the need to provide consumers with a unit of measure that simplifies value comparison. It was also noted that the NCWM has considered three different proposals for the method of sale of CNG: (a) joules, the unit of measure for energy prescribed in the International System of Units; (b) mass; and (c) the Gasoline Gallon Equivalent (GGE).

At the 78th NCWM Annual Meeting, the Natural Gas Vehicle Coalition (NGVC) recommended that the Gasoline Gallon Equivalent be adopted as the method of sale for CNG, and that it be based on a specific British Thermal Unit (Btu) energy content. This proposal was extensively discussed at the Working Group meeting. Everyone acknowledged that the energy contents of CNG and gasoline vary widely depending on source and the method of combination with other products. The Working Group agreed that field verification of Btu content would be possible through documentation provided by CNG suppliers. However, several people expressed concerns that following a paper trail would be a difficult and time-consuming process in most situations and probably impossible at locations where CNG is drawn directly from the wellhead.

During the discussion, a proposal was made to eliminate the reference to Btu content of CNG and replace it with a fixed conversion factor based on mass. See Item 337-2 on page 322 under the Agenda of the S&T Committee in the Report of the 78th NCWM under "Determination of Natural Gas Properties" for the research and background information used to develop the conversion factor. The Working Group accepted this proposal and recommended that the NCWM adopt the following definition as a national standard:

*The "Gasoline Gallon Equivalent" is defined as 5.660 pounds CNG*

The Gasoline Gallon Equivalent (GGE) of 5.660 pounds CNG was obtained as described in detail in Item 337-2 on page 322 in the Agenda of the S&T Committee in the Report of the 78th NCWM under "Determination of Natural Gas Properties" using reference values from the scientific literature and mean values from experimental testing.

The use of a standard GGE reduces or eliminates problems that would be encountered were the GGE based on the actual energy content of given samples of CNG, and weights and measures officials need not verify the Btu content of the CNG at the dispenser level. The GGE will be a useful tool for consumers for comparing the value of CNG to other fuels. Many CNG vehicles are dual use and can use either CNG or gasoline. If the NCWM adopts this method of sale, consumers could compare the price of the GGE to the price of gasoline and make purchasing decisions based on similar units of measure. Consumers would not purchase 1 gallon (231 cubic inches) of CNG, but would receive 5.660 pounds of CNG with the approximate "equivalent energy" of a gallon of gasoline. In use, vehicles will travel approximately the same distance on the "gallon equivalent" of CNG as on a liquid gallon of gasoline. As another benefit, the quantity of mass to derive the "Gasoline Gallon Equivalent" can be easily verified by weights and measures inspectors. The Working Group recommended that the term "Gasoline Gallon Equivalent," and no other, be permitted to make it clear that the term identifies a "derived" unit that is equivalent to a gallon of gasoline in terms of energy content, but is not actually a gallon of 231 cubic inches in volume.

**Working Group Recommendation for a Method of Sale:**

1. *The method of sale for retail sales of CNG as a vehicle fuel should be the "Gasoline Gallon Equivalent (GGE)."*
2. *A national conversion factor for the GGE should be defined as 5.660 pounds of CNG.*
3. *CNG dispensers should display three items of information: (1) total sale price (in dollars); (2) amount of CNG in GGE in this sale ; and (3) unit price per GGE (in dollars/GGE) (see Figure 1). A separate mass display for consumers may be provided, but should not be required.*
4. *The conversion factor should be stated on the customer indications of CNG dispensers for use in verification purposes and consumer information. See Figure 1 for an example.*

*Note: The labels would not need periodic revision because the 5.660 lb factor would be fixed.*

5. *Mass should be used to verify the accuracy of a device.*

The Working Group discussed environmental and safety issues concerning CNG handling procedures (e.g., it is known that test cylinders are sometimes vented to the atmosphere, which could result in fires). It is believed that the Environmental Protection Agency (EPA) has no specific regulation requiring the return of CNG test product to storage although air quality can be preserved only by eliminating venting to the atmosphere.

**Working Group Recommendation:**

*Product handling instructions should be included in an Examination Procedure Outline to discourage the practice of expelling CNG to the atmosphere. A User Requirement should be added to NIST Handbook 44 specifying that provisions must be made for returning product used in testing to storage at all retail CNG locations.*

- A proposal to require a display on dispensers to indicate the total mass of a sale, in addition to the other displays, was discussed by the Working Group. The majority of the members of the Working Group did not support the proposal. The concern centered on whether requiring devices to have an additional display for mass would help consumers and be worth the cost. Requiring a consumer display was not supported because: (1) the information would not aid consumers in value comparison without equivalent information for other types of fuels; (2) display of mass may be unnecessary for calibration or verification because inspectors can use the result of the total GGE value multiplied by 5.660 pounds to obtain the amount of CNG dispensed in pounds; and (3) it would increase the initial and maintenance costs of the dispenser.
- The Working Group agreed to defer development of a "Diesel Gallon Equivalent" until the issues related to the "Gasoline Gallon Equivalent" were decided by the NCWM and agreed to meet again if additional work is necessary.



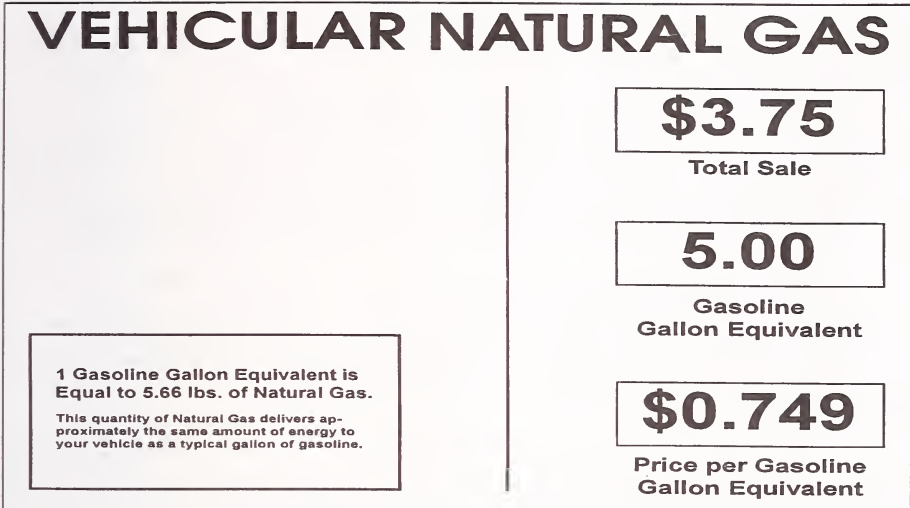


Figure 1. Dispenser Consumer Display

## Dispenser Test Procedure

Figure 2 illustrates how a field test of a CNG Dispenser is conducted. A test cylinder is placed on a scale and the scale is set to zero. Then 5 GGEs are dispensed into a test cylinder and the mass of the delivered amount is calculated.

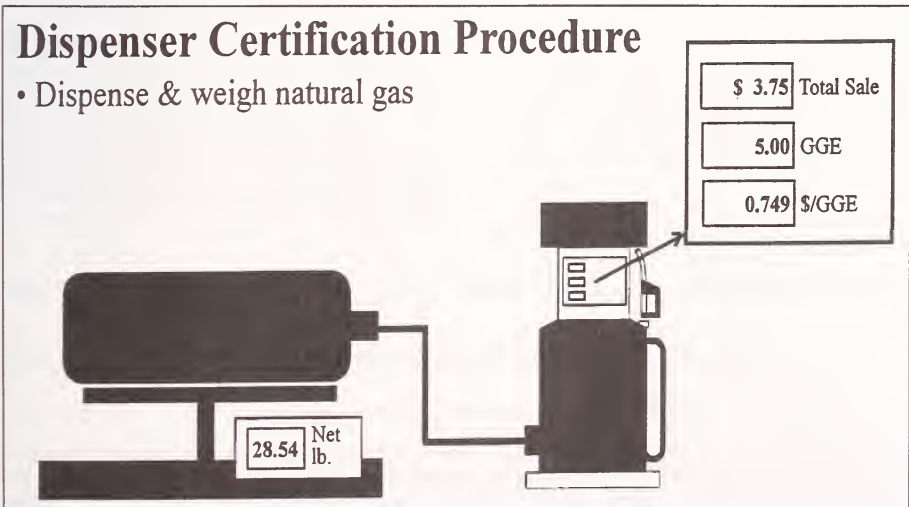


Figure 2. Illustration of a CNG Dispenser Test

### Calculations

1. Calculate the mass of indicated volume of the delivery (5 GGEs in Figure 2) by multiplying the total GGEs delivered times 5.660 pounds:

$$5 \text{ GGEs} \times 5.660 \text{ lb per GGE} = 28.30 \text{ lb}$$

2. The measuring error, in percent, for the device is determined by subtracting the calculated mass of the indicated delivery (28.30 lb) from the actual mass of the CNG delivered into the test cylinder (28.54 lb in Figure 2):

$$28.54 \text{ lb (actual mass of delivered CNG)} - 28.30 \text{ lb (mass of 5 GGEs)} = 0.24 \text{ lb}$$

The device error in percent is computed by dividing the error in mass by the actual mass delivered:

$$0.24 \text{ (device error in pounds)} \div 28.54 \text{ lb (actual mass of delivered CNG)} = 0.84 \text{ percent}$$

If the device in this example is a mass-flow meter, the allowable maintenance tolerance is  $\pm 2$  percent; therefore, the CNG dispenser would pass.

### Other Comments

The Committee believes that there should be a single value of 5.660 pounds of CNG for the GGE across the country. Adoption of different values on a State-by-State or regional basis should be avoided. The proposed value of 5.660 pounds of CNG value for the GGE was established using the average energy content of thousands of samples of natural gas from across the country, and on information on the energy content of gasoline from the Environmental Protection Agency.

Thus, comments received from some fuel suppliers and weights and measures officials correctly indicated that the natural gas available in some areas has a much higher energy content than natural gas found in other regions or from different sources. For example, the Committee heard from a supplier of liquefied natural gas (which is vaporized and dispensed as CNG) who requested that the NCWM exempt liquefied natural gas (LNG) from the 5.660-pound value. This request was based on the fact that LNG is a cleaner fuel that contains more energy. Several people told the Committee that LNG was equivalent to a "premium natural gas fuel." One firm asked the Committee to consider a value of 5.3 pounds of CNG for the GGE if the product was vaporized from LNG. Thus, NCWM adoption of the value of 5.660 pounds of CNG for the GGE may have a negative economic impact on the natural gas industry in some areas of the country. However, the Natural Gas Vehicle Coalition, and industry representatives that may be impacted by this recommended value stated at the Annual Meeting that, in spite of these concerns, it is in their industry's best interest to go forward with the adoption of the GGE with the 5.660-pound value so that a single method of sale for CNG is established. As the industry implements the method of sale and the marketplace matures, the impact of the method of sale (and the 5.660-lb value) can be monitored, and the need for any changes identified. Further work can be initiated with the NCWM, appropriate Federal agencies, and industry to address issues that may include the need for additional values for different "grades" of CNG, or further refinement of the 5.660-pound value.

**Committee Recommendation:** Accept the recommendations of the CNG Working Group and adopt a method of sale for CNG:

## 2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel

### 2.27.1. Definitions

**2.27.1.1. Natural Gas.** -- Natural gas means 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 kilogram of natural gas.

**2.27.1.3. Gasoline Gallon Equivalent (GGE).** -- Gasoline gallon equivalent (GGE) means 2.567 kilograms (5.660 pounds) of natural gas.

**2.27.2. Method of Retail Sale and Dispenser Labeling**

**2.27.2.1. Method of Retail Sale.** -- All natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE).

**2.27.2.2. Dispenser Labeling.** -- All retail natural gas 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 5.660 lb of Natural Gas" consistent with the method of sale used.

If this item is adopted, the method of sale will be added to the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation.

**232-5 I Standardized Size Descriptions for Shrimp**

**Background:** The National Fisheries Institute, Inc. (NFI), a trade association, has requested that the Uniform Method of Sale of Commodities Regulation include requirements that specify standardized size descriptors for shrimp sold from bulk or in package form. The requirement would apply only when the seller includes a size claim in connection with advertising shrimp for sale from bulk or in labeling packaged shrimp. The size descriptors suggested by NFI include 14 terms associated with a specific "count-per-pound." The terms used to describe sizes ranged from "extra small" (if more than 90 shrimp weigh a pound) to "super colossal" (when 9 shrimp or less weigh a pound). NFI members request action because many sellers use inconsistent size declarations which can confuse or mislead consumers.

The Western Weights and Measures Association and the Committee do not support the NFI recommendation because the proposal includes too many terms that would probably not provide meaningful information to consumers. The Committee believes that the goal of the NFI could be partially achieved if retailers included a "count-per-pound" declaration whenever they use size descriptors in advertisements, on package labels, or in conjunction with bulk sales. The Committee believes that a required count-per-pound statement along with a size declaration may help consumers to compare values. The following method of sale is presented for review over the next year and will be reconsidered at the Interim Meeting for the 80th NCWM in January 1995. Comments and suggestions are solicited.

***1.5.3. Size Descriptors for Raw, Shell-On Shrimp Products** -- If size descriptor terms for shrimp (e.g., small, medium, large, or colossal) are used on packages, advertisements, or on signs when offering shrimp for sale from bulk, a statement of count-per-kilogram, if sold by kilogram, or count-per-pound, if sold by pound, shall be included adjacent to the size descriptor (e.g., medium-large, 31-40 shrimp per pound).*

**232-6 VC Basis Weight for Communication Paper**

(This item was adopted as part of the consent calendar.)

**Background:** A question has been raised regarding proper and accurate labeling of "communication" paper, such as bond, mimeo, xerographic, or fan-folded computer paper. Due to the changing marketplace and consumer practices, these products are moving into more and more retail sales outlets. It has become necessary to alter label formats from the traditional methods, which were understood by the business users, to a format that complies with the Fair Packaging and

Labeling Act and is not confusing or deceptive to the retail consumer. Some paper manufacturers made these conversions when they added the SI declarations, which will be required on consumer products in 1994.

The issue deals with the "basis weight" declaration portion of the label statement. The word "weight" in the term appears to be a net quantity statement, but is not; it is the category or identity statement of a certain grade of product. This is the target to which a paper manufacturer runs the paper machine. Several factors involved in papermaking cause the basis weight to fluctuate greatly even though the equipment is set to a given number. Variations may be due to the fiber used (hardwood and softwood fibers do not react in the same way), coating consistencies, variations in speed of the equipment used, and/or the amount and type of recycled fiber. It has been shown over the course of papermaking manufacturing history that, due to these variations, paper weight grades such as "24-lb paper" or "20-lb paper" can be held to an accuracy of  $\pm 5$  percent of that target. New technologies, new equipment, and new processes today allow some of the newer machinery to control the accuracy of the paper grade within a slightly tighter tolerance than  $\pm 5$  percent, but a great number of paper machines still cannot control the accuracy of the grade closer than  $\pm 5$  percent.

The need for this  $\pm 5$  percent variation is also related to the accuracy of the test method for determining basis weight. The precision and bias described in American Society for Testing and Materials (ASTM) Standard Method D 646 for "Grammage of Paper and Paperboard" indicates that the repeatability within a laboratory is 0.94 percent, and reproducibility of results between laboratories is 2.84 percent.

Industry has made the following recommendation to the weights and measures jurisdiction that raised this issue:

1. The statement of the net quantity of contents for these products that should appear in the lower 30 percent of the principal display panel should indicate the sheet size and count contained in the package. The rationale is that buyers are only concerned with purchasing a paper product which is functional for their end use. Consumers want to know how many sheets are in a package and the size of those sheets. They are not purchasing "20 lb of paper" or "21 lb of paper," they want "X" number of sheets of "Y" size. It should be noted at this point that a lower basis weight does not necessarily equate to lower quality or price. Depending upon the location and type of materials used and energies required to manufacture paper products, a 20-lb product might in fact be superior in quality to and higher in price than a 22-lb paper. The proposal includes a requirement that the basis weight declared on the label be that specified by the original paper manufacturer.

2. The "basis weight," "grain direction," "color," "brightness level," etc., are all items of information about the product that relate to the suitability of the paper for particular applications and should, therefore, appear elsewhere on the label since this information truly only identifies the product category in the package.

The Western and Southern Weights and Measures Associations believe that the two issues should be addressed separately and recommend that the NCWM:

- define "communication paper" as packaged bond, mimeo, spirit duplicator, xerographic, and other papers, including cut-sized office paper and computer paper.
- adopt a Method of Sale for communication paper requiring packages to have a declaration of quantity of sheet size and count and a statement of identity that would include a basis weight determined in accordance with ASTM test methods. The statement of identity may also include grain direction, color, brightness, and hole-punch information.
- work with the paper industry to develop a verification method to determine if the basis weight declared as part of the identity statement is accurate.

At the 79th Annual Meeting, Chairman Bloch asked Robert G. Atkins, Chief, Los Angeles County Consumer Protection Bureau, and Richard L. Davis of the James River Corporation, to work with NIST to develop a field test procedure that can be used by field inspectors to determine if a basis weight declared as part of an identity statement is accurate.

**Committee Recommendation:** Adopt the following method of sale for packaged communication paper and work with the paper industry to develop a test method to verify a declared basis weight:

## **2.28. Communication Paper**

### **2.28.1. Definitions**

**2.28.1.1. Communication Paper.** -- "Communication paper" means packaged bond, mimeo, spirit duplicator, xerographic, and other papers, including cut-sized office paper and computer paper.

**2.28.1.2. Basis Weight.** -- "Basis weight" as used in this regulation for labeling means the grade, category, or identity of the paper determined according to the latest version of American Society for Testing and Materials Standard Method D 646 for "Grammage of Paper and Paperboard." Basis weight is used as a standard of identity and is not considered a net weight declaration.

### **2.28.2. Method of Retail Sale and Labeling**

**2.28.2.1. Method of Retail Sale.** -- All packaged communication paper kept, offered, or exposed for sale and sold at retail shall be sold in terms of sheet length and width and count.

**2.28.2.2. Labeling.** -- Communication paper in package form shall bear a label that includes:

(a) a declaration of quantity, in terms of sheet length and width and count, in the lower 30 percent of the principal display panel.

(b) a declaration of identity including the basis weight, and may include such other information as grain direction, color, brightness, printed lines, and hole punch information. Due to the variation in basis weight in manufacturing and analysis, the basis weight declared on the label shall correspond to the basis weight declared by the original manufacturer.

## **232-7 I 3.3. Machine-Vended Commodities**

(This item was changed to an information item at the 79th Annual Meeting.)

**Background:** This recommendation is to amend (c) in § 3.3. Machine Vended Commodities to exempt firms from having to indicate a statement of responsibility on a vending machine at a location where the responsible party is available to resolve any monetary discrepancies for consumers. The amendment will bring the section into agreement with Paragraph G-UR.3.4. in the General Code of NIST Handbook 44, which was amended at the 78th NCWM to include this exemption (see Item 310-3 UR.3.4. Responsibility, Money-Operated Devices in the Report of the 78th NCWM 1993, page 292). Section 3.3. was originally intended to apply to equipment installed either in unattended sites or those where the identity of the party responsible to correct any problems is not readily apparent. The L&R Committee believes that a statement of responsibility is not needed in situations where the responsible party is readily known and available. The purpose of this item was to bring Section 3.3 in NIST Handbook 130 into agreement with G-U.R. 3.4. in the General Code of NIST Handbook 44. Comments received on this item at the 79th Annual Meeting suggested additional changes that could not be made before consulting with the S&T Committee. It was changed from a voting issue to an information item so that the suggested amendments can be considered in cooperation with the S&T Committee at the 1995 Interim Meeting.

**Committee Recommendation:** Amend § 3.3.(c) as follows:

**3.3. Machine-Vended Commodities.** -- All vending machines dispensing packaged commodities shall indicate:

(a) product identity;



(b) net quantity; and

(c) name, address, and telephone number of party responsible for the vending machine. This requirement does not apply to devices at locations where employees are present and responsible for resolving any monetary discrepancies for the customer.

(d) The requirements for product identity and net quantity can be met either by display of the package or by information posted on the outside of the machine.

## 236 Uniform National Type Evaluation Regulation

### 236-1 I Revisions to the Uniform National Type Evaluation Regulation

**Background:** The Western Weights and Measures Association recommended revisions to the Uniform Regulation for National Type Evaluation to incorporate several of the policies and guidelines adopted by the NCWM Executive Committee and appearing in NCWM Publication 14. A draft revision of the regulation is included in Appendix A on page 227 for review and comment. The L&R Committee plans to incorporate the comments received into a second draft, which will be reviewed at the Interim Meeting for the 80th NCWM in January 1995.

## 237 Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation

### 237-1 V Fuel Quality Standard for Natural Gas

(This item was adopted.)

**Background:** See Item 232-4, under the Method of Sale of Commodities Regulation. The CNG Working Group discussed the need for a fuel quality standard for CNG to establish limits on water content. Excessive levels of moisture in CNG may affect metering accuracy and can reduce engine performance and service life. Another concern is that excessive water may reduce the useful life of some high-pressure storage containers used on vehicles. At the Working Group's meeting, the status of fuel standards for CNG used as an automotive fuel was reviewed by Robert E. Petsinger, President, CNG Services of Pittsburgh. Mr. Petsinger reported that the Society of Automotive Engineers (SAE) "Recommended Practice for Compressed Natural Gas Vehicle Fuel," J1616, would be balloted by SAE and might be referenced in vehicle owner's manuals in the near future. If adopted, SAE J1616 would be published in 1994. He also reported that the American Society for Testing and Materials (ASTM) is at least 2 years away from the development of a fuel quality standard for CNG.

#### Committee Recommendation:

The Petroleum Subcommittee should work with SAE and ASTM to develop a fuel quality standard for CNG when sold as a vehicle fuel. This standard should be included in the Uniform Motor Fuel Regulation.

**237-2 I Revisions to the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation**

**Background:** Celeste Bennett, Subcommittee Chairperson, Motor Fuel Coordinator, Michigan Department of Agriculture, presented the Petroleum Subcommittee's recommendations for revisions to the Uniform Motor Fuel Regulation. Discussion of the recommended changes is contained in a draft revision of the regulation that is included in the report of the Petroleum Subcommittee's activities in Appendix B on page 232. The draft revision of the Uniform Regulation for Engine Fuels, Petroleum Products, and Automotive Lubricants is Appendix D on page 243. The Committee recommends that proposed changes be studied and discussed at the regional weights and measures meetings and that comments be sent to the L&R Committee for consideration at the Interim Meeting in January 1995.

**238 NIST Handbook 130 - Interpretations and Guidelines**

**238-1 VC Revisions to § 2.6.6. Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory**

(This item was adopted as part of the consent calendar.)

**Background:** Celeste Bennett, Subcommittee Chairperson, Motor Fuel Coordinator, Michigan Department of Agriculture, presented the Petroleum Subcommittee's proposed revisions to the Recommendations for a Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory in Appendix E on page 251. The Committee recommends adoption of the Petroleum Subcommittee recommendations.

**Committee Recommendation:**

Adopt the Petroleum Subcommittee's revisions to the Recommendations for a Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory in Appendix E on page 251.

**238-2 VC 2.6.8. FTC Commodities**

(This item was adopted as part of the consent calendar.)

**Background:** The Committee believes that the information contained in Appendix G relating to commodities under Federal Trade Commission (FTC) jurisdiction under the Federal Fair Packaging and Labeling Act should be added to the Interpretations and Guidelines Section of NIST Handbook 130. This information was originally published in National Bureau of Standards Handbook 108, Weights and Measures Labeling Handbook (1971), which is out of print. The information will help weights and measures officials and manufacturers identify commodities subject to FTC jurisdiction and those that are only subject to State regulation.

**Committee Recommendation:**

Add a new section 2.6.8. Commodities Excluded From FTC Jurisdiction as shown in Appendix G to the Interpretations and Guidelines Section of NIST Handbook 130.

**240 Price Verification**

**240-1 I Examination Procedure for Price Verification**

**Background:** See Appendix F on page 259 for a detailed report of the Working Group on Price Verification. The Committee recommends that the Examination Procedure for Price Verification be field tested by jurisdictions and that comments, suggestions, and reports on the findings resulting from its use be forwarded to the Committee so that the Examination Procedure can be considered at the Interim Meeting in January 1995.

The L&R Committee sincerely appreciates the comments received on the third draft of the Examination Procedure Outline. The comments will be considered and, where possible, incorporated in a fourth draft that will be published by October 1, 1994. The fourth draft will serve as the basis of discussions at the 1995 Interim Meeting which will include a joint meeting of the L&R Committee and the Price Verification Working Group.

## **250 NIST Handbook 133**

### **250-1 V Revisions to NIST Handbook 133**

(This item was adopted.)

**Background:** This was Item 240-2 in the Report of the 78th NCWM, 1993, page 236. In the NCWM's petition to the Food and Drug Administration (FDA) on November 9, 1992, States requested an exemption from preemption under Section 403 A(b) of the Federal Food, Drug, and Cosmetic Act so that they could continue to use NIST Handbook 133, "Checking the Net Contents of Packaged Goods," for testing foods for the accuracy of their quantity declarations. The Food and Drug Administration had not responded to the petition at the time of the Annual Meeting. The FDA may deny the States' petition, hence the Committee recommended several changes to Handbook 133 so that FDA can consider adopting the handbook itself, and the States and FDA can then use the same test methods to enforce accurate net contents of packages.

The Handbook 133 Working Group was formed under the NCWM Laws and Regulations Committee in January 1993. One objective of the Working Group was to devise sampling plans that would meet the needs of FDA and other agencies that had already adopted Handbook 133. Current Handbook 133 sampling plans were developed based on 10 packages in a sample. These differ from those proposed (but never adopted) by FDA in 1980 using sample sizes based on 12 packages, convenient for sampling cases of boxed or canned commodities. In discussions over the years, FDA representatives expressed the need to retain the basis of 12 packages (the number of packages typically contained in a box or case of product) and to provide a sampling allowance at all levels of test. The Working Group focused on the request for a sampling allowance as described by the Food Industry Task Force in a June 4, 1993, letter. (Copies are available from the Office of Weights and Measures.)

At its second meeting on November 2, 1993, the Working Group unanimously agreed to the following recommended changes to NIST Handbook 133 to facilitate possible adoption by FDA in response to the NCWM petition dated November 9, 1992. The Working Group and the Committee have submitted these recommendations to FDA for its use in establishing NIST Handbook 133 as the standard for FDA and State and local weights and measures officials for verifying the quantity declarations on foods and, indirectly, on drugs and cosmetics. The goal is to achieve, to the maximum extent possible, national standardization in net contents inspection procedures among the various Federal, State, and local jurisdictions in order to facilitate trade between the States, permit fair competition among businesses, and provide uniform and sufficient protection to all consumers in commercial weights and measures practices. The changes recommended here will address most of the concerns expressed over the current practices in Handbook 133 and should, if accepted by the NCWM and FDA, help to both smooth and speed the process of achieving a single national standard for determining the net contents of packaged foods.

The sampling plan proposed below is based on the 1980 net weight proposal by FDA; it includes a slight modification of sample sizes and a new row with a sampling correction factor. The plan allows one package to exceed the individual package limits set by the Maximum Allowable Variations (MAV) in HB133 when the sample size is 48 and the lot size is more than 3,200 packages. The Committee also agreed that a statistical correction for small sample sizes or small inspection lots should be recommended. The statistical correction factor suggested in the following sampling plan is based on approximately 97 percent confidence limit (one-sided t test). It was the consensus of the Working Group and Committee that the sampling plans should be required by all agencies for official action at retail, wholesale, and point of packaging.

**Committee Recommendations:** Based on the recommendation of the NIST Handbook 133 Working Group and comments received at the public hearings at the Annual Meeting, the Committee recommends that NCWM adopt the following revisions to NIST Handbook 133.

• **Delete the finite population correction**

The f factor corrects for the fact that sampling probabilities are based on the assumption that the population from which a sample is drawn is infinite in size; the f factor generally affects the results by less than 10 percent when the sample is less than 20 percent of the lot. The f factor assumes that what is available for inspection is the total inspection lot. Since many packages at retail may already have been sold, the benefit of doubt will be shifted towards the packager by eliminating the f factor.

• **Adopt Table 1. Sampling Plans as amended to include sample correction factors for lots of 2 to 5 packages. If only one package is available for inspection the Maximum Allowable Variation (MAV) is applied.**

**Table 1. Sampling Plans**

1	2	3	0	5	
Lot Size (N)	Sample Size(n)	Sample Correction Factor  (2/√n)	Number of Minus Package Errors Allowed to Exceed the MAV	Tare Sample Size  (n <sub>t</sub> )	
1	1	MAV	0	Glass and Aerosol Containers	All Other Containers
2	2	1.000		2	2
3	4	1.154			
2	4	1.000			
6	5	.8944			
6	6	.8165			
7	7	.7559			
2	8	.7071			
7	4	.6667			
10	10	.6325			
11	11	.6030			
12 to 250	12	.5774	0	3	
251 to 3,200	24	.4082	0		
More than 3,200	48	.2887	1		
Sample Error Limit = sample standard deviation x sample correction factor					

Adoption of this proposal does not change the status of NIST Handbook 133 (Third Edition), tare procedures, or gray areas on meat and poultry products under the jurisdiction of the United States Department of Agriculture, or alter the tare procedures used to determine the drained weight of food products, or the definition of tare (e.g., that tare includes brine if the brine is not consumed with the food)

## Tare

The Committee recommends dry tare (or used dry tare) for inspection purposes, determined using the alternative tare procedures in HB133 for all official actions whether at point of pack or at retail. The Committee also agreed to increase the initial tare sample size for glass and aerosol containers for lots containing more than 251 packages to ensure that the wide weight variability common to this type of packaging is taken into account during the tare determination process (see Column 5 in Table 1. Sampling Plans for details).

- Adopt the Alternative Tare Procedure as the primary tare determination procedures for all products.

The following information will follow the table of sampling plans.

<sup>a</sup> Tare sample packages are kept in the order in which their corresponding random numbers were obtained. The random tare sample is the "initial tare sample" and is selected from the random sample. Used dry tare weights are determined by emptying, cleaning, drying (if necessary), and weighing all packaging materials. The range of tare weights ( $R_t$ ) and range of net weights ( $R_n$ ) are determined for the initial tare sample to within 0.01 lb.

$R_t/R_n$  is computed and this value is used to look up the value in Table 2.7 and determine if additional packages must be opened to determine tare. Additional tare packages are measured as necessary. Package errors are determined for the tare sample and for the rest of the sample by comparison with the nominal gross weight.

## Other Comments

### Maximum Allowable Variations

The Committee considered the status of the current MAV's to determine if work could be undertaken to revise them based on current information. The MAV's contained in NIST Handbook 133 were based on thousands of samples tested at the packing plant, at wholesale and at retail, of actual packaged products, food and nonfood, meat, poultry, random weight packages, gardening products, over-the-counter drugs, paper products, stationery goods, hardware items, etc., labeled by weight, volume, count, capacity, etc. The only criterion applied to package samples was that the average of the sample had to equal or exceed the labeled net contents. The standard deviations of packages as found were collected and plotted looking for qualitative differences in the product, for example, easy-to-pack versus hard-to-pack. No correlation was found except that the limits of the standard deviations increased as the net contents increased. An enveloping curve was constructed around these standard deviations. These curves became the MAV's. The original data upon which the MAV's were based were collected in the 1970's, and packagers have become more sophisticated in their ability to reduce packaging variations. The Working Group and the Committee agreed that limited resources prevent the NCWM from undertaking revisions to the MAV's at this time. However, the Committee is recommending that the number of packages allowed to exceed the MAV's in a sample be reduced in Table 1 for the reasons just described.

The Committee has also recommended that FDA adopt the following MAV tables from NIST Handbook 133:

- Table 2-8 "MAV's for an Individual Package Labeled by Weight"
- Table 2-9 "MAV's for an Individual Package Labeled by Volume - Liquid or Dry"
- Table 2-10 "MAV's for an Individual Package Labeled by Count"
- Table 2-11 "MAV's for an Individual Package Labeled by Length or Area"

### NIST Handbook 133 Working Group

The following weights and measures officials represent the National Conference on Weights and Measures on the NIST Handbook 133 Working Group:

- Barbara J. Bloch, Working Group Chairman, State of California
- Ross J. Andersen, State of New York - for the Northeastern Weights and Measures Association



- Barbara DeSalvo, State of Ohio - for the Central Weights and Measures Association
- Thomas Coleman, State of Maryland - for the Southern Weights and Measures Association
- Patrick Nichols, Director, Alameda County Weights and Measures, California - for the Western Weights and Measures Association

Packagers are represented by the Industry Weights and Measures Task Force that is comprised of nine trade associations including the Grocery Manufacturers of America, the American Bakers Association, the American Frozen Food Institute, the Food Marketing Institute, the National Fisheries Institute, International Dairy Foods Association, the National Food Processors Association, the National Pasta Association, and the Snack Food Association.

## **250-2 I Moisture Loss for Pasta**

**Background:** See Item 240-5 in the Report of the 75th NCWM, 1990, page 107; Item 240-4 in the Report of the 76th NCWM, 1991, page 219; Item 240-4 in the Report of the 77th NCWM, 1992, page 154, and Item 240-3 in the Report of the 78th NCWM, 1993, page 237, for background. A field study protocol has been developed by the National Pasta Association (NPA) for nationwide study to determine the moisture losses on various pasta products in different packaging materials. The study will be used to develop a gray area proposal for pasta products which lose moisture to the atmosphere. The Committee will continue to work closely with the members of the NPA and State weights and measures officials on this project. The following moisture loss allowances are requested by the National Pasta Association and are based on published studies (and additional information) that were conducted using guidance provided by the Food and Drug Administration:

Moisture Loss Allowances for Pasta	
When packaged in fiberboard boxes	5 percent of labeled net weight
When packaged in flexible packaging	3.2 percent of labeled net weight

## **250-3 I Moisture Loss for Rice**

**Background:** This was Item 240-7 in the Report of the 76th NCWM, 1991, pages 221-222, and Item 240-5 in the Report of the 77th NCWM, 1992, page 154. The Rice Millers Association (RMA) has requested the Conference address the moisture loss of packaged rice in a manner similar to flour, that is, to establish a gray area for packaged rice. A field study protocol has been developed by RMA for a nationwide study to determine the moisture losses of various rices in different packaging materials. The Committee will continue to work closely with the members of the RMA and State weights and measures officials on this project.

## **250-4 VC Aerosol Products -- Test Allowance for Foam Products**

(This item was adopted as part of the consent calendar.)

**Background:** See Item 240-6 in the Report of the 78th NCWM, 1993, page 238. Additional information can be found in Item 240-6 in the Report of the 76th NCWM, 1991, pages 220-222, and Item 240-8 in the Report of the 77th NCWM, 1992, page 155. At the Interim Meeting, the Committee reviewed the results of the studies conducted by weights and measures officials in Maryland and California and the Gillette Company laboratories to determine if a proposal to eliminate the test allowances for foam aerosol products (Table 3-2) in NIST Handbook 133 should be presented to the NCWM. The studies, which compared the NIST Handbook 133 procedures to the consumer use test, indicate that the results are comparable if the aerosol containers are not overshaken. Based on these studies and comments received at the Interim Meeting from a representative of the Gillette Company, the Committee recommends that:

### **Committee Recommendation:**

- (1) Delete the test allowances (Table 3-2 Test Allowances for Foam Aerosol Products in Appendix B) for foam aerosol products from NIST Handbook 133, and

- (2) amend the directions for shaking in § 3.11.4. Exhausting the Aerosol Container to read that the container should be shaken 5 times unless there are other instructions on the label.

The Committee extends its appreciation to the weights and measures officials in Maryland and California, the Gillette Company, and the members of the Chemical Specialty Manufacturers Association for their participation in and support of these studies.

## **250-5 I Gray Areas for Meat and Poultry Products**

**Background:** See Item 240-7 on page 239 in the Report of the 78th NCWM for background on this issue. The Committee will report on the status of this work at the Interim Meeting. Parties interested in participating in these studies should contact the Committee's Technical Advisor at the Office of Weights and Measures.

The Committee is planning to initiate studies in several of the following categories during 1995:

- Ice-packed bulk poultry
- Cured pork products (hams, shoulders, and loins)
- Cured beef products (corned beef, corned beef brisket, and tongues)
- Raw meat products (chopped beef, ground beef, hamburger, and beef patties)
- Ham patties, chopped ham, pressed ham, and similar products
- Dry salami and other meat or poultry products that lose moisture to the atmosphere

B. Bloch, California, Chairman

S. Rhoades, Arizona

L. Straub, Maryland

S. Millay, Maine

R. Gunja, Kansas City, Kansas

B. Bloch, California, Chairman, NIST Handbook 133 Working Group

E. Heffron, Michigan, Chairman, SI Working Group

C. Bennett, Michigan, Chairperson, Petroleum Subcommittee

G. Jorowski, Consumer Products Branch, Technical Advisor

G. Vinet, Legal Metrology Branch, Canada, Technical Advisor

K. Butcher, NIST, Technical Advisor

G. Coleman, NIST and Maryland Weights and Measures, Technical Advisor

## **Committee on Laws and Regulations**

**Appendix A**  
**Draft of a Revised**  
**Uniform Regulation for National Type**  
**Evaluation**

**1. Background**

The Uniform Regulation for National Type Evaluation is a necessary adjunct to recognize and enable participation in the National Type Evaluation Program administered by the National Institute of Standards and Technology. The Regulation specifically authorizes: type evaluation; recognition of a National Institute of Standards and Technology "Certificate of Conformance" of type; the State Measurement Laboratory to operate as a Participating Laboratory, if authorized by the National Institute of Standards and Technology under its program of accreditation of State Measurement Laboratories; and the State to charge fees to those persons who seek type evaluation of weighing and measuring devices.

**2. Intent**

The intent of this regulation is to encourage all States to use the National Type Evaluation Program, as approved by the National Conference on Weights and Measures, as their examining procedure.

**3. Status of Promulgation**

The table beginning on page 5 (in Handbook 130) shows the status of adoption of the Uniform Regulation for National Type Evaluation.

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## Uniform Regulation for National Type Evaluation

### Section 1. Application

This regulation shall apply to all classes of devices and/or equipment covered in National Institute of Standards and Technology Handbook 44.

### Section 2. Definitions

**2.1 Certificate of Conformance.** -- A National Type Evaluation Program Certificate of Conformance issued by the Chief of the Office of Weights and Measures of the National Institute of Standards and Technology establishing that the commercial weighing and measuring device, based on testing, meets the requirements of National Institute of Standards and Technology Handbook 44;

**2.2 Director.** -- means the \_\_\_\_\_ of the department of \_\_\_\_\_.

**2.3. National Type Evaluation Program.** -- A program of cooperation between the National Institute of Standards and Technology, the National Conference on Weights and Measures, the States, and the private sector for determining, on a uniform basis, conformance of a type with the relevant provisions of National Institute of Standards and Technology Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices.

**2.4. One-of-a-Kind Device.** -- A device manufactured for sale that has been categorized and tested as a "one-of-a-kind" device. If the manufacturer constructs an additional device or devices, the device is no longer considered to be "one-of-a-kind." This definition also applies to any device that has been determined to be a "one-of-a-kind" device by a weights and measures jurisdiction in one state and the manufacturer decides to manufacture and install the device in another state. In this case, the manufacturer must request an NTEP evaluation on the device through the normal application process, unless NTEP has already decided that such evaluation will not be conducted.

**2.5. Participating Laboratory.** -- Any State Measurement Laboratory that has been accredited by the National Institute of Standards and Technology, in accordance with its program for the Certification of

Capability of State Measurement Laboratories, to conduct a type evaluation under the National Type Evaluation Program.

**2.6. Remanufactured Devices.** -- Devices to which an overhaul or replacement of parts has been performed so the device can be installed in a new location.

**2.7. Repaired Devices.** -- The maintenance or replacement of parts for devices to remain or return to service in the same location.

**2.8. Type.** -- A model or models of a particular measurement system, instrument, or element that positively identifies the design. A specific type may vary in its measurement ranges, size, performance, and operating characteristics as specified in the Certificate of Conformance.

**2.9. Type Evaluation.** -- The testing, examination, and/or evaluation of a type by a Participating Laboratory under the National Type Evaluation Program.

**2.10. Commercial and Law-Enforcement Equipment.** -- (a) Weighing and measuring equipment commercially used or employed in establishing the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award, or in computing any basic charge or payment for services rendered on the basis of weight or measure. (b) Any accessory attached to or used in connection with a commercial weighing or measuring device when such accessory is so designed that its operation affects the accuracy of the device. (c) Weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.<sup>NOTE 1, see page 229</sup>

### Section 3. Certificate of Conformance

The Director shall require any weight or measure, or any weighing or measuring instrument or device to have a Certificate of Conformance prior to its installation or use for commercial or law enforcement purposes. *Note 1: The section is identical to G-A.1., § 1.10, General Code, National Institute of Standards*



*and Technology Handbook 44 for definition of "commercial" and "law enforcement equipment."*

#### **Section 4. Certificate of Conformance; Specific Requirements.**

(1) No person shall sell a commercial weighing or measuring device unless a Certificate of Conformance has been issued for the device, except when the device is exempted by this section.

(2) No person shall use a commercial weighing or measuring device unless a Certificate of Conformance has been issued for the device prior to use, except when the device is exempted by subsection (3), (4), or (5) of this section.

(3) Commercial weighing or measuring devices in service prior to \_\_\_\_\_, 19\_\_, which meet the specifications, tolerances, and other technical requirements of National Institute of Standards and Technology Handbook 44 shall be exempt from meeting the requirements for the Certificate of Conformance.

(4) Commercial weighing or measuring devices in service prior to \_\_\_\_\_, 19\_\_, removed from service by the owner or on which the department has issued a removal order after \_\_\_\_\_, 19\_\_, and returned to service at a later date shall be modified to meet all specifications, tolerances, and other technical requirements of National Institute of Standards and Technology Handbook 44 as adopted by the Legislature, on the date of the return to service. Such commercial weighing and measuring devices shall not be required to have a Certificate of Conformance.

(5) Commercial weighing or measuring devices in service prior to \_\_\_\_\_, 19\_\_, which are remanufactured, modified, or upgraded after such date shall meet all specifications, tolerances, and other technical requirements of National Institute of Standards and Technology Handbook 44 adopted by the Legislature on the date of the modification or upgrading. Such commercial weighing and measuring devices shall not be required to have a Certificate of Conformance.

(6) Devices in service prior to \_\_\_\_\_, 19\_\_, that are still in use and are no longer being manufactured may be sold to another jurisdiction, provided that the device meets current requirements as of the date of installation in the new jurisdiction; however, no NTEP Certificate of Conformance is required.

(7) "One-of-a-kind Devices" do not require an NTEP Certificate of Conformance. However, if the manufacturer decides to make an additional device or devices, the device will no longer be considered to be "one-of-a-kind" and an NTEP evaluation must be conducted on the device. For scales, any load cells and electronic indicators must have an NTEP Certificate of Conformance.

(8) Repaired devices:

(a) With an existing NTEP Certificate of Conformance will not have their Certificate of Conformance invalidated, provided that replacement parts are consistent with the design and quality of the original parts. Repaired devices without an NTEP Certificate of Conformance will not be required to have an NTEP evaluation.

(b) For scales, if load cells are repaired by other than the original manufacturer or the manufacturer's authorized agent, then the Certificate of Conformance for the load cell does not apply to the repaired load cells.

(c) Replacement of metrologically significant mechanical parts with parts of a different design invalidates the original Certificate of Conformance.

(9) Remanufactured Devices:

(a) If a device with an existing NTEP Certificate of Conformance is remanufactured by the original equipment manufacturer or authorized agent using original equipment parts, no additional evaluation is required, and the original Certificate of Conformance applies, *provided* that the remanufacturing process does not modify the design of the device. If a device without an existing NTEP Certificate of Conformance is remanufactured by the original equipment manufacturer, or authorized agent, the device must be submitted to NTEP for evaluation.

(b) If a device with or without an existing NTEP Certificate of Conformance is remanufactured by a remanufacturer (e.g., a company other than the OEM or authorized agent), the device must be marked with the remanufacturer's name, model designation, non-repetitive serial number, and the qualifier for the serial number as required by G-S.1, General Code of Handbook 44. A device considered by the manufacturer to be a typical example of the remanufactured devices overhauled by the remanufacturer must be submitted to NTEP for evaluation.

(10) Copies of Devices:

If a company copies the design of a device made by another company that has a Certificate of Conformance for the device, the Certificate of Conformance does not apply to the model that is a copy. The company that copied the device must get its own type evaluation on the device.

(11) Scale or Weighing System Components

If a person buys NTEP load cells and an NTEP indicating element and then manufactures a scale or weighing system from the parts, the complete device must be submitted for type evaluation.

### **Section 5. Participating Laboratory and Agreements**

The Director is authorized to:

(1) Operate a Participating Laboratory as part of the National Type Evaluation Program. In this regard, the Director is authorized to charge and collect fees for type evaluation services.

(2) Cooperate with and enter into agreements with any person in order to carry out the purposes of the act.

### **Section 6. Unlawful Acts**

It shall be unlawful for any person to:

(1) Use any commercial weighing and measuring device in a commercial application unless a Certificate of Conformance has been issued for such device unless exempt in Section 4.

(2) Sell any weighing and measuring device for use in a commercial application unless a Certificate of Conformance has been issued for such devices unless exempt in Section 4.

### **Section 7. Revocation of Conflicting Regulations**

All provisions of all orders and regulations heretofore issued on this same subject that are contrary to or inconsistent with the provisions of this regulation, and specifically \_\_\_\_, are hereby revoked.

### **Section 8. Effective Date**

This regulation shall become effective on \_\_\_\_\_.  
Given under my hand and the seal of my office in the  
City \_\_\_\_ of on this day of \_\_\_\_, 19\_\_.

## **Appendix B**

### **Report of the Petroleum Subcommittee to the Laws and Regulations Committee**

Celeste Bennett, Chairperson  
Motor Fuel Coordinator, Michigan Department of Agriculture

#### ***Summary***

Even though the work of the Subcommittee has not been completed, the Subcommittee recommends that the Laws and Regulations Committee review and endorse the many revisions to the Fuel Law and Fuel Regulation, as appended, for States to use to update their own requirements. Rather than delay the entire law or regulation until standards are developed for biodiesel, E85, M85, etc., or until certain other controversies are resolved, the Subcommittee submits the attached documents to be considered by the Laws and Regulations Committee at its Interim Meeting, January 1994. The Subcommittee proposes that the Laws and Regulations Committee consider recommending to the NCWM a:

- revision to the Uniform Law;
- revision and great expansion to the Uniform Regulation;
- revision to the Laboratory Guide; and
- new Field Sampling Guide.

#### **Questions for the Laws and Regulations Committee:**

It is not apparent to the Subcommittee how the Laboratory and Field Sampling Guides should be made available in publication form. Perhaps they can be added to Handbook 130, or be made available as separate publications.

Drafts of the Laboratory and Field Sampling Guides are being revised and will be distributed for review and comment when complete.

In addition, the Subcommittee recommends that the Laws and Regulations Committee determine whether further clarification or standardization of terms could be incorporated into the sections on Administrative and Civil Penalties of all the uniform laws (see II.A.2. below).

#### **Further work for the Subcommittee includes:**

- **Resolve oxygenate labeling.** Uniform Regulation: Paragraph 3.1. on labeling all oxygenates is unresolved at the present time.
- **Add lubricant standards.** Uniform Law and Regulation: If the States agree that lubricant standards should be incorporated in the law and regulation, a new mix of technical and industrial sector participants will need to be formed for work to begin in this area.
- **Urge the development and adoption of national standards for a wide variety of alternative fuels.** Subcommittee members must interface with technical standards development organizations to assist in development of standards that can be adopted by State quality fuel programs for alternative fuels including:
  - Reformulated Gasoline
  - Biodiesel
  - Compressed Natural Gas
  - M85 Fuel Methanol

- M100 Fuel Methanol
- E85 Fuel Ethanol
- Liquefied Natural Gas

These fuels are defined in Section 1 of the revised regulation, but national standards have not yet been formulated for them. The Subcommittee had originally added these fuels to Section 2 of the revised regulation as headings with the note "Pending. No standard specification yet available" but has chosen to delete the headings for simplicity in the current revision. **It is the intention of the Subcommittee to cover alternative fuels as soon as recognized standards are available.**

**Resolve LPG standards issue.** The Subcommittee has been made aware that:

1. contracts for all wholesale propane sales reference GPA 2140, "Liquefied Petroleum Gas Specifications and Test Methods," and that the provisions of GPA 2140 are identical with ASTM D 1835; and
2. the Subcommittee must investigate whether engine or vehicle manufacturers require the use of HD-5, warn the driver to switch if driveability problems ensue, or in any other way recommend the use of HD-5. The specifications removed until this issue could be clarified are shown shaded below.

**2.8. Liquefied Petroleum (LP) Gases** shall meet ASTM D 1835, "Standard Specification for Liquefied Petroleum (LP) Gases" (identical to Gas Processors Association 2140, "Liquefied Petroleum Gas Specification and Test Methods").

**Note:** Grade "Special-Duty Propane" (propane HD-5) is required in most spark-ignition engines.

## I. Background

The Petroleum Subcommittee was established in 1992 under the Laws and Regulations Committee to represent the interests of those States with petroleum quality programs, and to continuously improve the motor fuel law and regulation in Handbook 130. Public sector membership includes its Chair, Celeste Bennett, MI; Barbara Bloch, CA, representing the Western Region; N. David Smith, NC; Eric Hamilton, FL; and Randy Jennings, TN; all representing the Southern Region; Ron Hayes, MO, representing the Central Region; and Charles Gardner, NY, representing the Northeastern Region. John Bartfai, NY; David Lazier, CA; Neil Blickman, Federal Trade Commission; and Bruce Kolowich, Environmental Protection Agency; are also public sector members. From the private sector, Jim Williams, American Petroleum Institute (API); Fairman Thompson, South Point Ethanol; Jim Steiger, American Automobile Manufacturers Association; William Scheller, Scheller & Associates; Bob Reynolds, Downstream Alternatives; David Phillips, National Gas Vehicle Coalition; Robert Petsinger, CNG Services of Pittsburgh; Jim Peeples, Information Resources; Dan Moenter, Marathon Oil; Marilyn Herman, Herman & Associates and Renewable Fuels Association; Lew Gibbs, Chevron Research & Technology; Win Gardner, Mobil Oil; Bob Furey, General Motors Research and Development Center; Bill Butterbaugh, National Propane Gas Association (NPGA); Wayne Becker, Inspectorate America Corporation; Syd Andrews, Consultant; and, Christopher Dyson, Public Citizen; are also members. Several Subcommittee members are officers in ASTM Committee D-2 on Petroleum Products and Lubricants. Other members bring significant experience and expertise in other major standards development organizations, including the Society of Automotive Engineers, and in critical regulated industries. The National Conference is indebted to these dedicated contributors to needed quality standards and regulations.

At its first meeting in 1992, four work groups were established: (1) a Law Work Group to review, and revise where necessary, the Uniform Motor Fuel Inspection Law; (2) a Regulation Work Group to expand the scope of the Uniform Motor Fuel Regulation; (3) a Laboratory Work Group to update the guide for Petroleum Quality Laboratories; and (4) a Field Sampling Work Group to provide a new guide in sampling, field testing, and safety for field inspection personnel. The discussion below focusses on the Law and Regulation. Appendix C contains the recommended revised law; Appendix D the regulation. Appendix E contains the recommendations of the Laboratory Work Group.

## **II. Summary of Proposals by the Subcommittee to the Laws and Regulations Committee**

### ***A. Revision of Uniform Motor Fuel Inspection Law -- See Appendix C on page 240***

#### ***1. Amend title, add definitions, remove registration of all fuels, and add administrative and civil penalties***

The Law Work Group is chaired by Eric Hamilton, FL, with members N. David Smith, NC, Bill Butterbaugh, NPGA, and Jim Williams, API. The drafts of this Work Group were reviewed in detail at two meetings of the full Subcommittee. As a result of their deliberations, it is recommended that the Law be broadened in scope to include all engine fuels, including gases as well as liquids, and other petroleum products and lubricants: its new title should be "Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law." (The term "engine fuel" is recommended to replace "motor fuel" in order to be technically accurate; internal combustion engines are not motors.) The Subcommittee recommends that an expanded list of definitions should be added, and the law should be updated and patterned after the Uniform Weights and Measures Law by incorporating administrative, civil, and criminal penalties sections. Finally, the requirement to register all fuels was modified to only require registration of special fuels that have no ASTM standards applying to them, such as racing fuels, or agricultural, off-road fuels. The recommended revision is appended.

#### ***2. Clarification of Penalties Sections in All Laws***

At Law Work Group and full Subcommittee meetings, the administrative, civil, and criminal penalty provisions of the Uniform Weights and Measures Law were discussed. There appears to be confusion between the differing States' terminology and meaning of a civil penalty and a civil action and the wording in the Uniform Weights and Measures Law. At both the Federal and State levels, civil penalties are levied by an administrative agency. A respondent who does not agree to the charges or the penalty may request an administrative hearing. Once the respondent has exhausted administrative appeals and if the civil penalty has been upheld, the agency may file a civil action to collect the penalty as with any other lawful debt. In most cases, once administrative appeals have been exhausted, the respondent opts to pay the civil penalty rather than incur additional court costs when the agency initiates court action to collect the penalty. These points may need clarification in the Uniform Laws, both the Weights and Measures and Engine Fuels Laws. In addition, it may be necessary to include other types of penalties explicitly, such as suspension of product registration or other actions. Therefore, the Subcommittee recommends that the Laws and Regulations Committee review and clarify those penalty sections of all the laws in Handbook 130. See the minor editorial revisions made to the Subcommittee's Engine Fuel Law Draft.

### ***B. Revision of the Uniform Motor Fuel Regulation -- See Appendix D on page 243***

#### ***1. Addition of needed definitions***

The Regulation Work Group is chaired by Ron Hayes, MO. Other members include Randy Jennings, TN, Marilyn Herman, Herman & Associates, on behalf of the Renewable Fuels Association, and Win Gardner, Mobil Oil Corporation. Recommendations from the Work Group and the Subcommittee are to greatly expand the regulation to include many more definitions, (for example, antiknock index, aviation fuels, cetane index, fuel oil, lead substitute, reformulated gasoline, substantially similar) and to make other parts of the regulation clearer to enforcement agencies as to specific requirements. Most significant recommendations are discussed separately below.

#### ***2. Paragraph 2.1. Volatility Standards for Gasoline Blended with Ethanol***

In an effort to direct the Subcommittee away from revisiting ethanol-gasoline issues which had already been extensively covered by the Conference, some members were advised upon their appointment that gasoline-ethanol labeling issues would be outside the scope of the Subcommittee. Paragraph 2.1. was examined by the Regulation work group as part of its responsibility to expand the regulation. The public sector members recommended at the April 1993 meeting that this section be revised. This section was discussed extensively at the April 1993 meeting with differing proposals on how to update it. A vote was taken to ascertain which proposal was acceptable to the Subcommittee members. Despite a consensus vote, this item was not fully resolved at the April meeting. The Conference Chairman and the Executive Secretary asked the Subcommittee to clearly identify what was wrong with the existing standard, explain how the proposed revisions solved any identified problems, and sufficiently document the rationale behind the recommendation for change. All decisions needed to be explored sufficiently to persuade the L & R Committee and



other Conference members that a change was needed and would be beneficial. The entire issue was reviewed at the October meeting.

The public members of the Regulation Work Group articulated their reasons for believing that the existing paragraph needed revision: (1) Gasoline volatility standards are one factor contributing to satisfactory automobile driveability; too high a volatility often leads to vapor lock and other driveability problems. This paragraph, as written in the present regulation, appears to exempt gasoline ethanol blends from volatility standards, but is not clear as to which volatility measurements are exempted, nor that certain volatility requirements are imposed by the EPA. (2) The base gasoline used to blend with ethanol is required to meet all ASTM standards. However, State regulators often do not have access to the base gasoline in order to ensure its quality, making this requirement unenforceable. Moreover, industry and State technical representatives explain that base gasolines that do not meet ASTM specifications in some measurement areas can, when blended with ethanol, meet all of the ASTM specifications.

EPA allows the Reid vapor pressure of gasoline ethanol blends to be 1.0 pound per square inch higher than the ASTM limit for other fuels during certain periods of the year. For States that are considering adopting engine fuel requirements, EPA requirements must be folded into other standards that the States would require to be met. The State representatives on the Regulation Work Group unanimously felt that, in order to ensure good driveability with gasoline-ethanol blends, similar limits should be set on the vapor pressure of gasoline ethanol blends all year round. The ethanol industry representatives agreed that this clarification for gasoline-ethanol blends could be added to NCWM recommendations without harm to their industry and would indeed ensure good driveability for fuels that met these standards. Although the States admitted that they rarely test the quality of base gasoline, petroleum industry representatives agreed to limits on the base gasoline when it was available for quality testing. Finally, there is the question of whether requirements imposed by States in order to comply with the Clean Air Act are indeed included in the "rules, regulations, and Clean Air Act waivers of the U.S. EPA." The Subcommittee agreed that these State Implementation Plans were constructed in order to comply with EPA requirements, and therefore were inferentially under EPA requirements. The Subcommittee decided to clarify this question. At its meeting in Ann Arbor, the Subcommittee revised Section 2.1 of the Uniform Regulation as follows.

**2.1. ~~Spark Ignition Motor Fuel~~ Gasoline and Gasoline-Oxygenate Blends<sup>1</sup>** (as defined in this regulation) shall meet the following requirements:

**2.1.1. The most recent version of** ASTM D 4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," except that volatility standards for unleaded gasoline blended ~~containing up to 10 percent<sup>2</sup> with ethanol~~ shall not be more restrictive than those adopted under the rules, regulations, and Clean Air Act waivers of the U.S. Environmental Protection Agency ~~(which includes rules promulgated by the State)<sup>3</sup>, and further provided that the gasoline used in the blend meets the volatility specifications of ASTM for the area and season in which the blend is sold<sup>4</sup>.~~ In addition, either:

**2.1.1.1. The base gasoline used in such blends shall meet the requirements of ASTM D 4814<sup>5</sup>, or**

**2.1.1.2. The blend shall meet the requirements of ASTM D 4814<sup>6</sup>, or**

**2.1.1.3. The base gasoline used in such blends shall meet all the requirements of ASTM D 4814 except distillation, and the blend shall meet the distillation requirements of the ASTM specification<sup>7</sup>, and**

**2.1.2 ~~4.4~~. In no case shall a blend of gasoline and ethanol exceed the ASTM D 4814 vapor pressure standard by more than 1.0 psi<sup>8</sup>.**

The following footnotes explain why other changes and additions were made. See the footnotes in the recommended revision above.

<sup>1</sup>"Spark-Ignition Motor Fuel" was changed to "Gasoline and Gasoline-Oxygenate Blends" to be consistent with definitions in the proposed regulation. The definition "Engine Fuel" includes gaseous fuels.

<sup>2</sup>"...up to 10%" is not specific enough. In VOC control periods (June 1 - Sept. 15 and for some states from May 1 to Sept. 15), EPA imposes gasoline volatility limits on all gasoline sold in the U.S. and limits the volatility waiver to 9 - 10 vol% ethanol as provided for in Section 211(h) of the Clean Air Act and the agency's Phase 1 and 2 volatility regulations that predated passage of the Clean Air Act. For all other times of the year, EPA does not regulate the volatility of any gasoline-ethanol blend, except

that the terms of the Section 211(f) "Gasohol" waiver apply. Including the complete EPA rules would make the document too complex and lengthy.

<sup>3</sup>Recommended to clarify that State Implementation Plans are also considered part of the requirements under the Clean Air Act.

<sup>4</sup>Removed so that the following subparagraphs could be added to clarify fuel requirements that apply.

<sup>5</sup>This is the same requirement as the original, that the base gasoline meet ASTM standards; in addition, two other possibilities have been added with the word "or" that are intended to recognize current blending practices and provide more flexibility to the blender while still helping to protect the driving public from one possible source of serious driveability problems.

<sup>6</sup>This requirement, if met, provides the greatest uniformity since all ASTM volatility parameters would be met.

<sup>7</sup>This subparagraph permits distillation properties of the base gasoline to be outside of ASTM standard boundaries, as long as the final blend of gasoline and ethanol meets the distillation limits set by ASTM.

<sup>8</sup>This paragraph is the most important clarification for State engine fuel quality laboratories since it specifies tolerances in vapor pressure for the final gasoline-ethanol blend.

This recommendation was accepted by the Subcommittee attending the meeting as maintaining the main body of the original version, and satisfying the specific needs of the Public Sector. After the meeting in Ann Arbor, some Subcommittee members questioned the complexity of the above language and recommended a simplified version. This version was accepted by the Subcommittee by mail ballot.

**2.1. Gasoline and Gasoline-Oxygenate Blends (as defined in this regulation) shall meet the following requirements:**

**2.1.1. The most recent version of ASTM D 4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," except that volatility standards for unleaded gasoline blended with ethanol shall not be more restrictive than those adopted under the rules, regulations, and Clean Air Act waivers of the U.S. Environmental Protection Agency (which includes rules promulgated by the State). If gasoline is blended with ethanol, it shall be blended under one of the following options:**

**2.1.1.1. The base gasoline used in such blends shall meet the requirements of ASTM D 4814, or**

**2.1.1.2. The blend shall meet the requirements of ASTM D 4814, or**

**2.1.1.3. The base gasoline used in such blends shall meet all the requirements of ASTM D 4814 except distillation, and the blend shall meet the distillation requirements of the ASTM specification.**

**2.1.2. In no case, shall a blend of gasoline and ethanol exceed the ASTM D 4814 vapor pressure standard by more than 1.0 psi.**

**3. Section 3. Labeling and Method of Sale Issues**

**i. Additional Labeling Requirements and the Federal Trade Commission (FTC) Octane Rule**

The FTC amended its Octane Certification and Posting Rule to include alternative liquid engine fuels including, among others, methanol and ethanol. References to this new rule have been included in the proposed revision to the regulation. The amended Octane Rule, which went into effect on October 25, 1993, requires sellers of alternative liquid fuels to determine, certify, and post an "automotive fuel rating" consisting of the common name of the fuel along with a disclosure of the amount, expressed as a minimum percentage by volume, of the principal component of the fuel. These new posting requirements extend to all liquid engine fuels except diesel fuel. (Copies of the final rule are available from the FTC's Public Reference Branch, Room 130, 6th Street and Pennsylvania Avenue, NW, Washington, DC 20580, 202-326-2222; contact Neil Blickman at 202-326-3038 for technical details.)

The Subcommittee also recommends specific identity labeling for diesel fuel (for example, 1-D), aviation turbine fuels (referencing National Fire Protection Association Standards), aviation gasoline (Grade 100LL, for example), fuel oils (for example, No. 5), kerosene (incorporated from the Uniform Regulation for the Method of Sale of Commodities), liquefied petroleum gas (for example, "special-duty propane"), compressed natural gas (CNG) and liquefied natural gas (LNG).

*ii. Prohibition against those terms that imply a certain antiknock index (octane)*

Many consumers and regulatory agencies have complained about marketers using terms such as "super" or "premium" to describe gasoline or gasoline blends that have relatively low antiknock indices. Other marketers use other terms in misleading ways, such as naming an 87 antiknock index (octane) gasoline "plus" because there is an 86 octane available at the retail site. Many States regulate the terms that can be applied to gasolines in order to provide some minimum protection to the potential purchaser. Several alternatives were considered. One solution that was offered was to require that the antiknock index be posted wherever the fuel was advertised. However, this alternative was discarded when the costs of revised signage were considered; the Subcommittee decided it was not reasonable to impose large costs on every marketer because a few used deceptive names. When the issue of whether to limit the names selected was initially discussed, the petroleum industry representatives on the Subcommittee expressed their industry's desire not to interfere with any company's marketing prerogatives. Weights and measures representatives pointed out that misrepresentation of a product is prohibited, but that uniform requirements should be formulated that are clear enough for all States to adopt and enforce uniformly. As mentioned earlier, many States already limit terms that may be used with certain antiknock indices. Therefore, Lew Gibbs, Chevron, constructed a table that the Subcommittee agreed was a minimum standard. This table does not eliminate fanciful names such as "lite," "silver," or "gold." However, it is applicable across the nation in all geographical regions:

It is prohibited to use specific terms to describe a grade of gasoline or gasoline-oxygenate blend unless it meets the minimum antiknock index shown in the following table.

Term	Minimum Antiknock Index	
	ASTM D 4814 Altitude Reduction Areas IV and V	All Other ASTM D 4814 Areas
Premium, Super, Supreme, High Test	90	91
Midgrade, Plus	87	89
Regular Leaded	<del>90</del>	88
Regular, Unleaded (alone)	85	87

The Subcommittee rejected requirements that the antiknock index be posted on the advertising (street-side) sign, or that the antiknock index be made part of the grade name (such as "Ajax Supreme 93") since these requirements would add additional costs to all marketers, not just to those abusing the public's purchasing habits.

*iii. Labeling of Leaded and Lead Substitute Fuels*

The Subcommittee spent some time on the distinctions that must be made between lead substitute and leaded fuels. It spent less time on appropriate labeling and standardization definitions for leaded fuels since these will be phased out by regulation as of 1995. Since the soonest that the NCWM could act on the Subcommittee's recommendations (assuming that the Laws and Regulations Committee chooses to recommend the subcommittee's work) would be July 1994, and the recommendations would take effect January 1, 1995, the Subcommittee decided to focus its energies on other priorities even though States have had some problems with leaded fuels. Requirements for lead labeling and nozzle size are addressed.

*4. Section 4. Retail Storage Tanks*

A new section is recommended clarifying the amount of water to be permitted in storage tanks of liquid engine fuels. A proposal to require a "suitable filter" on each dispenser meter inlet or discharge line for fuels containing alcohol was rejected by the Subcommittee when its members reviewed responses to a survey of state agencies and information from gas pump manufacturers on the cost and possible difficulties that would be encountered if filter retrofitting were required. It is the opinion of the

Subcommittee that the objective of the regulation should be to maintain the quality of the fuel, not to dictate how the private sector should achieve compliance.

### *C. Laboratory and Field Sampling Guides*

The Laboratory Work Group revised "Recommendations for a Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory." The Work Group is chaired by Eric Hamilton, FL, and members are William Scheller and Wayne Becker. Tom Hudson, Inspectorate Corporation, and Michael Steffey, NM, also contributed to the guide. The Subcommittee recommends that the L&R Committee publish these guides as part of its Interim Report and find a mechanism for broad distribution to enforcement agencies. The Subcommittee will continue to update and refine these guides as part of its ongoing responsibilities. This draft appears as Appendix E.

The Field Sampling Work Group drafted a Field Sampling Guide for sampling and testing, with major emphasis on inspector and public safety. The Work Group is chaired by Charles Gardner, NY, with members, Barbara Bloch, CA, and Neil Blickman, FTC. David Lazier, CA, also contributed substantially to the guide. The Field Sampling Guide is being developed and will be distributed separately for review and comment.

## **III. Future Work**

### *A. Section 3.1 Gasoline-Oxygenate Blend Labeling*

This section currently requires that all engine fuel containing 1% or more by volume of any oxygenate or combination of oxygenates be labeled with the specific type of oxygenate (but not the amount). Oxygenates are chemical compounds containing carbon, hydrogen and oxygen that are added to gasoline to provide oxygen to meet wintertime state programs as well as boost the octane of gasoline without requiring the addition of lead. Present recommendations of the NCWM require documentation to be furnished throughout the marketing chain that a particular fuel contains oxygenates over 1% by volume so that the retailer can label the dispensers.

Labeling of ethanol blended fuel (gasohol) originated either to advertise the use of ethanol or due to the insistence of automobile manufacturers. It is contended that the label laws were lobbied in most state legislatures on that basis. However, methanol blends were especially difficult to keep blended, and the methanol was especially hard on certain elastomeric components of the vehicle. Because both ethanol and methanol tend to separate from the gasoline in the presence of water, and because some older engines and fuel systems may experience problems from certain elastomers breaking down in the presence of these alcohols, manufacturers of automobiles and small engine suggest that the vehicle or engine owner switch from gasoline-alcohol blends if driveability problems are encountered. In addition, specific aircraft have been issued FAA supplemental type certificates for the use of automotive gasoline that meets ASTM D 4814 specifications and that does not contain alcohol. A vehicle owner cannot follow the manufacturer's advice (or the FAA certification in the case of aircraft) unless the engine fuel is labeled.

Many of the issues applying to alcohols apply to MTBE as well. Specifically, some older vehicles and equipment may experience minor problems. Some fluorocarbon products, such as Viton, deteriorate from exposure to MTBE and several vehicle manufacturers recommend a switch from MTBE blends if driveability problems are experienced. A vehicle owner cannot follow the manufacturer's advice unless MTBE is labeled. (See Reports of the 75th and 76th NCWM.)

Thus, the NCWM expanded its recommendation to label all oxygenates added to gasoline in amounts more than 1% by volume. Due to the varying chemical composition of these oxygenates, the labeling trigger (1% by volume) translates to varying mass amounts of oxygen, depending on the specific type of oxygenate. For clean air purposes, gasoline containing some kind of oxygenate is now required during part of the year in many parts of the United States. Many of these oxygenates are more like gasoline than ethanol in their chemical properties, and do not have as much potential of separating from the gasoline in the presence of water (although blends containing MTBE can have higher moisture content) or of affecting flexible components of the vehicle. Many of the oxygenates are forms of ethers, however, and some purchasers have complained of the odor and have questioned the potential health effects of the oxygenate, although this was not the reason that the labeling requirements for MTBE and other oxygenates were added in 1991.

Today, oxygenates including ethanol, methyl-tertiary-butyl-ether (MTBE), ethyl-tertiary-butyl-ether (ETBE), tertiary amyl methyl ether (TAME), and di-isopropyl-ether (DIPE) are added at the refinery or terminal. To complicate matters, the product retained



(called "heel") in any refinery blend tank during the process may contain a different oxygenate than subsequent batches. Also, terminal and service station storage tanks are usually never completely emptied. Therefore, new deliveries of fuel mix with the fuel which remains in the tank. Thus, with so many different oxygenates in use today, a very general pump label may be all that can be provided.

In addition, the 1 percent by volume trigger for labeling does not coincide with 0.35 percent by mass oxygen content (or more than 0.15 percent by mass if methanol is the only oxygenate) which is recommended to define gasoline-oxygenate and gasoline-alcohol blends in ASTM D 4814. It had been selected originally as the amount that could be practically measured by State enforcement agencies without question as to whether the amount was "trace."

At the present time, the Subcommittee believes that more information is needed from both the public and private sector to evaluate whether this paragraph needs modification. Questions include:

1. How many States have adopted, or intend to adopt Paragraph 3.1. from the Uniform Motor Fuel Regulation requiring that all oxygenates be labeled?
2. For those States that have adopted the requirement, how do they enforce it? What measurements do they make? What documentation do they use to ensure that proper labeling is in place? What labeling do they consider proper when many different types of oxygenates may be present?
3. For those States that have not adopted the requirement, why haven't they?
4. What kind of documentation do petroleum marketers provide in custody transfer in those States that require all oxygenates to be labeled? Do marketers have evidence of problems with documentation and labeling?

The Subcommittee plans to canvass its private sector members and to conduct a survey of the State petroleum programs. It will use its findings to determine whether to modify this paragraph at a future time.

#### ***B. Alternative Fuel Standards Still Needed***

The Regulations Work Group plans to add ASTM or other national technical standards when they become available for engine fuels including biodiesel, CNG, and others.

#### ***C. Controversy Concerning Requiring HD-5 for LPG***

The Subcommittee has been made aware that it must investigate whether engine or vehicle manufacturers require the use of HD-5, warn the driver to switch if driveability problems ensue, or in any other way recommend the use of HD-5. The specifications removed until this issue could be clarified are shown shaded below:

**2.8. Liquefied Petroleum (LP) Gases** shall meet ASTM D 1835, "Standard Specification for Liquefied Petroleum (LP) Gases" (identical to Gas Processors Association 2140, "Liquefied Petroleum Gas Specification and Test Methods").

Note: Grade "Special-Duty Propane" (propane HD-5) is required in most spark-ignition engines.

#### ***D. Customer Feedback***

A survey that was sent to the States earlier this year stated: "It is proposed that the Uniform Law be expanded to cover brake fluid, coolants, etc." The States were asked whether the Uniform Law and Regulation should be expanded to brake fluid and coolants "as a high priority." Since the question was not as specific as the information needed by the Subcommittee, a new questionnaire will be generated. Many States consider the regulation of motor oil to have high priority, but brake fluid and coolants to be low priority. The Subcommittee needs to verify that States need the law and regulation expanded to include lubricants. Also, there appears to be recent interest in recycling antifreeze; this may generate the need to impose quality specifications for coolants.



## Appendix C

### Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law

#### Section 1. Purpose

There should be uniform requirements for engine fuels, petroleum products, and automotive lubricants among the several States. This Act provides for the establishment of quality specifications for these products.

#### Section 2. Scope

The Act establishes a sampling, testing, and enforcement program, provides authority for fee collection, requires registration of engine fuels, and empowers the State to promulgate regulations as needed to carry out the provisions of the Act. It also provides for administrative, civil, and criminal penalties.

#### Section 3. Definitions

As used in this act:

**3.1. Engine Fuel.** -- means any liquid or gaseous matter used for the generation of power in an internal combustion engine.

**3.2. Director.** -- means the \_\_\_\_\_ of the Department of \_\_\_\_\_ and designated agents.

**3.3. Person.** -- means an individual, corporation, company, society, association, partnership, or governmental entity.

**3.4. ASTM.** -- means the American Society for Testing and Materials, a national voluntary consensus standards organization formed for the development of standards on characteristics and performance of materials, products, systems, and services, and the promotion of related knowledge.

**3.5. Petroleum Products.** -- means products obtained from distilling and processing of petroleum (crude oil), unfinished oils, recycled oils, natural gas liquids, refinery blend stocks, and other miscellaneous hydrocarbon compounds.

**3.6. Automotive Lubricants.** -- means any material interposed between two surfaces that reduces the friction or wear between them.

**3.7. Engine Fuel Designed for Special Use.** -- means engine fuels designated by the Director requiring registration. These fuels normally have no ASTM or other national consensus standards applying to their quality or useability; common special fuels are racing fuels and those intended for agricultural and other off-road applications.

**3.8. Sold.** -- means kept, offered, or exposed for sale, or sold.

#### Section 4. Administration, Adoption of Standards, and Rules

The provisions of the Act shall be administered by the Director. For the purpose of administering and giving effect to the provisions of this Act, the specification and test method standards set forth in the most recent edition of the Annual Book of ASTM Standards and supplements thereto, and revisions thereof, are adopted except as amended or modified as required to comply with Federal and State laws by the Director. When no ASTM standard exists, other generally recognized national consensus standards may be used. The Director is empowered to write rules and regulations on the advertising, posting of prices, labeling, standards for, and identity of fuels, petroleum products, and automotive lubricants and is authorized to establish a testing laboratory.

#### Section 5. General Duties and Powers

The Director shall have the authority to:

**5.1.** Enforce and administer all the provisions of this Act by inspections, analyses, and other appropriate actions.

**5.2.** Have access during normal business hours to all places where engine fuels, petroleum products, and automotive lubricants are kept, transferred, offered, exposed for sale, or sold for the purpose of examination, inspection, taking of samples,

and investigation. If such access shall be refused by the owner or agent or other persons leasing the same, the Director may obtain an administrative search warrant from a court of competent jurisdiction.

**5.3.** Collect, or cause to be collected, samples of engine fuels, petroleum products, and automotive lubricants marketed in this State, and cause such samples to be tested or analyzed for compliance with the provisions of this Act.

**5.4.** Define engine fuels for special use and refuse, revoke, suspend, or issue a stop-order if found not to be in compliance and remand stop-order if the engine fuel for special use is brought into full compliance with this Act.

**5.5.** Issue a stop-sale order for any engine fuel, petroleum product, and automotive lubricant found not to be in compliance and remand stop-sale order if the engine fuel, petroleum product, or automotive lubricant is brought into full compliance with this Act.

**5.6.** Refuse, revoke, or suspend the registration of an engine fuel, petroleum product, or automotive lubricant.

**5.7.** Delegate to appropriate personnel any of these responsibilities for the proper administration of this Act.

## **Section 6. Registration of Engine Fuels Designed for Special Use**

All engine fuels designed for special use must be registered with the Director. Such registration shall include:

**6.1.** Name, brand, or trademark under which the fuel will be sold.

**6.2.** Name and address of person registering the engine fuel.

**6.3.** The special use for which the engine fuel is designed.

**6.4.** Certification, declaration, or affidavit stating the specifications which the fuel will meet upon testing.

## **Section 7. Inspection Fee**

There shall be a fee of \$\_\_\_\_\_ per appropriate unit of measure on all products covered under the scope of this Act marketed within this State for the purposes of

administering and effectively enforcing the provisions of this Act.

## **Section 8. Prohibited Acts**

It shall be unlawful to:

**8.1.** Represent engine fuels, petroleum products, or automotive lubricants in any manner that may deceive or tend to deceive the purchaser as to the nature, price, quantity and/or quality of such products.

**8.2.** Fail to register an engine fuel designed for special use.

**8.3.** Submit incorrect, misleading, or false information regarding the registration of an engine fuel designed for special use.

**8.4.** Hinder or obstruct the Director in the performance of the Director's duties.

**8.5.** Represent an engine fuel, petroleum product, or automotive lubricant that is contrary to the provisions of this Act.

## **Section 9. Administrative and Civil Penalties**

Any person who violates any provision of the Act or regulations promulgated thereto may be subject to administrative action, civil action, and civil penalty.

**9.1 Administrative Hearing:** The Director or his/her designee shall be authorized to conduct an administrative hearing and, upon notice and an opportunity to be heard, may assess a civil penalty of

(a) not less than \$\_\_\_\_\_ nor more than \$\_\_\_\_\_ for a first violation,

(b) not less than \$\_\_\_\_\_ nor more than \$\_\_\_\_\_ for a second violation within 2 years from the date of the first violation, and

(c) not less than \$\_\_\_\_\_ nor more than \$\_\_\_\_\_ for a third violation within 2 years from the date of the first violation upon the finding of a violation of any provision of this Act.

The decision of the director shall be subject to appropriate judicial review.

**9.2** A civil action may be brought by the Director in any court of competent jurisdiction to recover a civil penalty of:

(a) Not less than \$ \_\_\_\_\_ nor more than \$ \_\_\_\_\_ for a first violation;

(b) Not less than \$ \_\_\_\_\_ nor more than \$ \_\_\_\_\_ for a second violation within 2 years from the date of the first violation;

(c) Not less than \$ \_\_\_\_\_ nor more than \$ \_\_\_\_\_ for a third violation within 2 years from the date of the first violation;

Any person who by himself or herself, by his or her servant or agent, or as the servant or agent of another person commits any of the acts enumerated in Section 8 may be subject to a civil penalty.

Any civil penalty collected under this Act shall be transmitted to the State Treasurer, who shall credit the same to the \_\_\_\_\_ fund.

## **Section 10. Criminal Penalties**

**10.1 Misdemeanor.** Any person who violates any provision of this Act or regulations promulgated thereto shall be guilty of a Class \_\_\_\_\_ misdemeanor, and upon conviction shall be punished by a fine of not less than \$ \_\_\_\_\_ nor more than \$ \_\_\_\_\_, or imprisonment for not less than \_\_\_\_\_ nor more than \_\_\_\_\_, or both fine and imprisonment.

**10.2 Felony.** Any person who intentionally violates any provision of this Act or regulations promulgated thereto or is convicted under the misdemeanor provisions of this section more than three times in a 2-year period shall be guilty of a Class \_\_\_\_\_ felony, and upon conviction shall be punished by a fine of not less than \$ \_\_\_\_\_ nor more than \$ \_\_\_\_\_, or imprisonment for not less than \_\_\_\_\_ nor more than \_\_\_\_\_, or both fine and imprisonment.

## **Section 11. Restraining Order and Injunction**

The Director is authorized to apply to any court of competent jurisdiction for a restraining order, or a temporary or permanent injunction, restraining any person from violating any provision of this Act.

## **Section 12. Severability Provisions**

If any word, phrase, provision, or portion of this Act shall be held in a court of competent jurisdiction to be unconstitutional or invalid, the unconstitutionality or invalidity shall apply only to such word, phrase, provision, or portion, and for this purpose the provisions of this Act are declared to be severable.

## **Section 13. Repeal of Conflicting Laws**

All laws and parts of laws contrary to or inconsistent with the provisions of this Act are repealed except as to offense committed, liabilities incurred, and claims made thereunder prior to the effective date of this Act.

## **Section 14. Citation**

This Act may be cited as the "Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Act of \_\_\_\_\_."

## **Section 15. Effective Date**

This Act shall become effective on \_\_\_\_\_.

## Appendix D

### Uniform Regulation for Engine Fuels, Petroleum Products, and Automotive Lubricants

#### 1. Definitions

**1.1. ASTM.** -- The American Society for Testing and Materials means the national voluntary consensus standards organization formed for the development of standards on characteristics and performance of materials, products, systems, and services; and the promotion of related knowledge.

**1.2. Antiknock Index (AKI).** -- means the arithmetic average of the Research octane number (RON) and Motor octane number (MON):  $AKI = (RON + MON) / 2$ . This value is called by a variety of names, in addition to antiknock index, including: Octane rating, Posted octane, (R+M)/2 octane.

**1.3. Automotive Fuel Rating.** -- means the automotive fuel rating required under the amended Octane Certification and Posting Rule (or as amended, the Fuel Rating Rule), 16 CFR Part 306. Under this Rule, sellers of liquid automotive fuels, including alternative fuels, must determine, certify, and post an appropriate automotive fuel rating. The automotive fuel rating for gasoline is the antiknock index (octane rating). The automotive fuel rating for alternative liquid fuels consists of the common name of the fuel along with a disclosure of the amount, expressed as a minimum percentage by volume, of the principal component of the fuel. For alternative liquid automotive fuels, a disclosure of other components, expressed as a minimum percentage by volume, may be included, if desired.

**1.4. Automotive Gasoline, Automotive Gasoline-Oxygenate Blend.** -- means a type of fuel suitable for use in spark-ignition automobile engines and also commonly used in marine and non-automotive applications.

**1.5. Aviation Gasoline.** -- means a type of gasoline suitable for use as a fuel in an aviation spark-ignition internal combustion engine.

**1.6. Aviation Turbine Fuel.** -- means a refined middle distillate suitable for use as a fuel in an aviation gas turbine internal combustion engine.

**1.7. Base Gasoline.** -- means all components other than ethanol in a blend of gasoline and ethanol.

**1.8. Biodiesel.** -- means a blend consisting of diesel fuel and a substantial amount of esterified animal fats and/or vegetable oil(s).

**1.9. Cetane Index.** -- means an approximation of the cetane number of distillate diesel fuel, which does not contain a cetane improver additive, calculated from the density and distillation measurements.

**1.10. Cetane Number.** -- means a numerical measure of the ignition performance of a diesel fuel obtained by comparing it to reference fuels in a standardized engine test.

**1.11. Compressed Natural Gas (CNG).** -- means natural gas which has been compressed and dispensed into fuel storage containers and is suitable for use as an engine fuel.

**1.12. Denatured Fuel Ethanol.** -- means "ethanol" (see below.)

**1.13. Diesel Fuel.** -- means a refined middle distillate suitable for use as a fuel in a compression-ignition (diesel) internal combustion engine.

**1.14. Distillate.** -- means any product obtained by condensing the vapors given off by boiling petroleum or its products.

**1.15. EPA.** -- means the United States Environmental Protection Agency.

**1.16. E85 Fuel Ethanol.** -- means a blend of denatured fuel ethanol and hydrocarbons, wherein the ethanol portion is nominally 85 percent (85%) by volume, suitable for use as a fuel in spark-ignition internal combustion engines.

**1.17. Engine Fuel.** -- means any liquid or gaseous matter used for the generation of power in an internal combustion engine.

**1.18. Ethanol.** -- also known as "Denatured Fuel Ethanol," means nominally anhydrous ethyl alcohol meeting ASTM D 4806 standards. It is intended to be blended with gasoline for use as a fuel in a spark-ignition internal combustion engine. The denatured fuel ethanol is

first made unfit for drinking by the addition of Bureau-of-Alcohol,-Tobacco,-and- Firearms-(BATF)-approved substances before blending with gasoline.

**1.19. Fuel Oil.** -- means a refined oil middle distillates, heavy distillates, or residues of refining, or blends of these, suitable for use as a fuel for heating or power generation, the classification of which shall be defined by ASTM D 396.

**1.20. Gasoline.** -- means a volatile mixture of liquid hydrocarbons generally containing small amounts of additives suitable for use as a fuel in a spark-ignition internal combustion engine.

**1.21. Gasoline-Alcohol Blend.** -- means a fuel consisting primarily of gasoline and a substantial amount (more than 0.35 mass percent oxygen, or more than 0.15 mass percent oxygen if methanol is the only oxygenate) of one or more alcohols.

**1.22. Gasoline-Oxygenate Blend.** -- means a fuel consisting primarily of gasoline along with a substantial amount (more than 0.35 mass percent oxygen, or more than 0.15 mass oxygen if methanol is the only oxygenate) of one or more oxygenates.

**1.23. Kerosene.** -- (or "Kerosine") means a refined middle distillate suitable for use as a fuel for heating or illuminating, the classification for which shall be defined by ASTM D 3699.

**1.24. Lead Substitute.** -- means an EPA- registered gasoline additive suitable, when added in small amounts to fuel, to reduce or prevent exhaust valve recession (or seat wear) in automotive spark-ignition internal combustion engines designed to operate on leaded fuel.

**1.25. Lead Substitute Engine Fuel.** -- means, for labeling purposes, a gasoline or gasoline-oxygenate blend that contains a "lead substitute."

**1.26. Leaded.** -- means, for labeling purposes, any gasoline or gasoline-oxygenate blend which contains more than 0.013 gram lead per liter (0.05 gram lead per U.S. gallon). NOTE: EPA defines leaded fuel as one which contains more than 0.0013 gram phosphorus per liter (0.005 gram per U.S. gallon), or any fuel to which lead or phosphorus is intentionally added.

**1.27. Liquefied Natural Gas (LNG).** -- means natural gas that has been liquefied at -126.1 °C (-259 °F) and stored in insulated cryogenic tanks for use as an engine fuel.

**1.28. Liquefied Petroleum Gas (LPG).** -- means a mixture of normally gaseous hydrocarbons, predominantly propane, or butane, or both, that has been liquefied by compression or cooling, or both to facilitate storage, transport, and handling.

**1.29. Low Sulfur.** -- means low sulfur diesel fuel that meets ASTM D 975 (e.g., Grade Low Sulfur No. 1-D or Grade Low Sulfur No. 2-D) standards. Diesel fuel containing higher amounts of sulfur for off-road use is defined by EPA regulations.

**1.30. M100 Fuel Methanol.** -- means anhydrous methyl alcohol, generally containing small amounts of additives, suitable for use as a fuel in a compression-ignition internal combustion engine.

**1.31. M85 Fuel Methanol.** -- means a blend of anhydrous methyl alcohol and hydrocarbons, in which the methanol portion is nominally 85 percent by volume.

**1.32. Motor Octane Number.** -- means a numerical indication of a spark-ignition engine fuel's resistance to knock obtained by comparison with reference fuels in a standardized ASTM D 2700 Motor Method engine test.

**1.33. Oxygen Content of Gasoline.** -- means the percentage of oxygen by mass contained in a gasoline.

**1.34. Oxygenate.** -- means an oxygen-containing, ashless, organic compound, such as an alcohol or ether, which can be used as a fuel or fuel supplement.

**1.35. Reformulated Gasoline.** -- means a volatile mixture of liquid hydrocarbons and oxygenates meeting the reformulated gasoline requirements of the Clean Air Act Amendments of 1990 and suitable for use as a fuel in a spark-ignition internal combustion engine.

**1.36. Research Octane Number.** -- means a numerical indication of a spark-ignition engine fuel's resistance to knock obtained by comparison with reference fuels in a standardized ASTM D 2699 Research Method engine test.

**1.37. SAE.** -- means the Society of Automotive Engineers, a technical organization for engineers, scientists, technicians, and others in positions that cooperate closely in the engineering, design, manufacture, use, and maintainability of self-propelled vehicles.



**1.38. Substantially Similar.** -- means the EPA's "Substantially Similar" rule, Section 211 (f) (1) of the Clean Air Act [42 U.S.C. 7545 (f) (1)].

**1.39. Total Alcohol.** -- means the aggregate total in volume percent of all alcohol contained in any fuel defined in this Chapter.

**1.40. Total Oxygenate.** -- means the aggregate total in volume percent of all oxygenates contained in any fuel defined in this Chapter.

**1.41. Unleaded.** -- in conjunction with "engine fuel" or "gasoline" means any gasoline or gasoline-oxygenate blend to which no lead or phosphorus compounds have been intentionally added and which contains not more than 0.013 gram lead per liter (0.05 gram lead per U.S. gallon) and not more than 0.0013 gram phosphorus per liter (0.005 gram phosphorus per U.S. gallon).

## 2. Standard Fuel Specifications

**2.1. Gasoline and Gasoline-Oxygenate Blends** (as defined in this regulation) shall meet the following requirements:

**2.1.1.** The most recent version of ASTM D 4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," except that volatility standards for unleaded gasoline blended with ethanol shall not be more restrictive than those adopted under the rules, regulations, and Clean Air Act waivers of the U.S. Environmental Protection Agency (which includes rules promulgated by the State). If gasoline is blended with ethanol, it shall be blended under one of the following options:

**2.1.1.1.** The base gasoline used in such blends shall meet the requirements of ASTM D 4814, or

**2.1.1.2.** The blend shall meet the requirements of ASTM D 4814, or

**2.1.1.3.** The base gasoline used in such blends shall meet all the requirements of ASTM D 4814 except distillation, and the blend shall meet the distillation requirements of the ASTM specification.

**2.1.2.** In no case, shall a blend of gasoline and ethanol exceed the ASTM D 4814 vapor pressure standard by more than 1.0 psi.

**2.1.3. Minimum AKI.** -- 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;

**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;

**2.1.5. Minimum Lead Content to Be Termed "Leaded".** -- Gasoline and gasoline-oxygenate blends sold as "leaded" shall contain a minimum of 0.013 gram of lead per liter (0.05 gram per U.S. gallon);

**2.1.6. Lead Substitute Gasoline.** -- Gasoline and gasoline-oxygenate blends sold as "lead substitute" gasoline shall contain a lead substitute which provides protection against exhaust valve seat recession equivalent to at least 0.026 gram of lead per liter (0.10 gram per U.S. gallon).

**2.1.6.1. Documentation of Valve Seat Protection.** -- Upon the request of the director, the lead substitute additive manufacturer shall provide documentation to the director that demonstrates that the treatment level recommended by the additive manufacturer provides protection against exhaust valve seat recession equivalent to or better than 0.026 gram per liter (0.1 g/gal) lead. The director may review the documentation and approve the lead substitute additive before such additive is blended into gasoline. This documentation shall consist of:

**2.1.6.1.1.** Test results as published in the Federal Register by the EPA Administrator as required in Section 211(f)(2) of the Clean Air Act; or

**2.1.6.1.2.** Until such a time as the EPA Administrator develops and publishes a test procedure to determine the additive's effectiveness in reducing valve seat wear, test results and description of the test procedures used in comparing the effectiveness of 0.026 gram per liter lead and the recommended treatment level of the lead substitute additive shall be provided.

**2.1.7. Blending.** -- Leaded, lead substitute and unleaded gasoline-oxygenate blends shall be blended according to the EPA "substantially similar" rule or an EPA waiver for unleaded fuel.

**2.2. Diesel Fuel** shall meet the most recent version of ASTM D 975, "Standard Specification for Diesel Fuel Oils."

**2.3. Aviation Turbine Fuels** shall meet the most recent version of ASTM D 1655, "Standard Specification for Aviation Turbine Fuels."

**2.4. Aviation Gasoline** shall meet the most recent version of ASTM D 910, "Standard Specification for Aviation Gasoline."

**2.5. Fuel Oils** shall meet the most recent version of ASTM D 396, "Standard Specification for Fuel Oils."

**2.6. Kerosene (Kerosine)** shall meet the most recent version of ASTM D 3699, "Standard Specification for Kerosine."

**2.7. Ethanol** intended for blending with gasoline shall meet the most recent version of ASTM D 4806, "Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel."

**2.8. Liquefied Petroleum (LP) Gases** shall meet ASTM D 1835, "Standard Specification for Liquefied Petroleum (LP) Gases" (identical to Gas Processors Association 2140, "Liquefied Petroleum Gas Specification and Test Methods").

### **Section 3. Classification and Method of Sale of Petroleum Products**

#### **3.1. General Considerations**

**3.1.1. Documentation.** -- When gasoline; gasoline-oxygenate blends; reformulated gasoline; M85 and M100 fuel methanol; E85 and E100 fuel ethanol; liquefied petroleum (LP) gases; compressed natural gas; liquefied natural gas; biodiesel; diesel fuel; kerosene; aviation gasoline; aviation turbine fuels; or, fuel oils are sold, an invoice, bill of lading, shipping paper or other documentation, must accompany each delivery other than a retail sale. This document must identify the quantity, the name of the product, the particular grade of the product, the applicable automotive fuel rating, and oxygenate type and content (if applicable), the name and address of the seller and buyer, and the date and time of the sale. Documentation must be retained at the retail establishment for a period not less than 1 year.

**3.1.2. Dispenser Labeling.** -- All retail dispensing devices must identify conspicuously the type of product, the particular grade of the product, and the applicable automotive fuel rating.

**3.1.3. Grade Name.** -- The sale of any product under any grade name that indicates to the purchaser that it is of a certain automotive fuel rating or ASTM grade shall not be permitted unless the automotive fuel rating or grade indicated in the grade name is consistent with the value and meets the requirements of Section 2, Standard Fuel Specifications.

#### **3.2. Automotive Gasoline and Automotive Gasoline-Oxygenate Blends**

##### **3.2.1. Posting of Antiknock Index Required.**

- All automotive gasoline and automotive gasoline-oxygenate blends shall post the antiknock index in accordance with applicable regulations, 16 CFR Part 306 issued pursuant to the Petroleum Marketing Practices Act, as amended.

##### **3.2.2. When the Term "Leaded" May Be Used.**

-- The term "leaded" shall only be used when the fuel meets specification requirements of paragraph 2.1.5.

##### **3.2.3. Use of Lead Substitute Must Be Disclosed.**

-- Each dispensing device from which gasoline or gasoline oxygenate blend containing a lead substitute is dispensed shall display the following legend: "Contains Lead Substitute." The lettering of this legend shall not be less than 12 millimeters (1/2 inch) in height and the color of the lettering shall be in definite contrast to the background color to which it is applied.

##### **3.2.4. Nozzle Requirements for Leaded Fuel.**

-- Each dispensing device from which gasoline or gasoline-oxygenate blends that contains lead in amounts sufficient to be considered "leaded" gasoline, or lead substitute engine fuel, is sold shall be equipped with a nozzle spout having a terminal end with an outside diameter of not less than 23.63 millimeters (0.930 inches).

**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 the table below:

##### **3.2.6. Method of Retail Sale - Type of Oxygenate Must be Disclosed.**

-- All automotive gasoline or automotive gasoline-oxygenate blends kept, offered, or exposed for sale, or sold, at retail containing at least 1 percent by volume of any oxygenate or combination of oxygenates shall be identified as "with" or "containing" (or similar wording) the specific type of oxygenate(s) in the engine fuel. For example, the label may read "contains ethanol" or "with MTBE/ETBE." This

information shall be posted on the upper 50 percent of the dispenser front panel in a position clear and conspicuous from the driver's position, in a type at least 1/2 inch in height, 1/16 inch stroke (width of type). (Amended 1991)

### 3.2.7. Alternative Liquid Fuel Labeling. --

Dispensers dispensing M85 or M100 fuel methanol or E85 or E100 fuel ethanol shall post the alternative fuel rating.

### 3.2.8. Documentation for dispenser labeling purposes. --

The retailer must be provided, at the time of delivery of the fuel, on an invoice, bill of lading, shipping paper, or other documentation, a declaration of any oxygenate or combination of oxygenates present in concentrations of at least 1 percent by volume in the fuel. This documentation is only for dispenser labeling purposes; it is the responsibility of any potential blender to determine the total oxygen content of the engine fuel before blending. (Amended 1991) *[Labeling issues still under discussion by Subcommittee.]*

## 3.3. Diesel Fuel

### 3.3.1. Labeling of Grade Required. --

Diesel Fuel shall be identified by grades No. 1-D, No. 1-D (low sulfur), No. 2-D, No. 2-D (low sulfur), or No. 4-D. Each retail dispenser of diesel fuel shall be labeled according to the grade being dispensed except the words "low sulfur" are not required.

### 3.3.2. Location of Label. --

These labels shall be located on the upper 50 percent of the dispenser front

panel in a position clear and conspicuous from the drivers position, in a type at least 12 millimeter (1/2 inch) in height, 1.5 millimeter (1/16 inch) stroke (width of type).

## 3.4. Aviation Turbine Fuels

**3.4.1. Labeling of Grade Required. --** Aviation turbine fuels shall be identified by Jet A, Jet A-1, or Jet B.

### 3.4.2. NFPA Labeling Requirements Also

**Apply. --** Each dispenser or airport fuel truck dispensing aviation turbine fuels shall be labeled in accordance with the most recent edition of National Fire Protection Association NFPA 407, "Standard for Aircraft Fuel Servicing." NFPA 407, 1990 Edition: Section 2-3.18 Product Identification Signs. Each aircraft fuel servicing vehicle shall have a sign on each side and the rear to indicate the product. The sign shall have letters at least 3 inches (75 mm) high of color sharply contrasting with its background for visibility. It shall show the word "FLAMMABLE" and the name of the product carried, such as "JET A," "JET B," "GASOLINE," or "AVGAS." (NOTE: Refer to the most recent edition.)

## 3.5. Aviation Gasoline

### 3.5.1. Labeling of Grade Required. --

Aviation gasoline shall be identified by Grade 80, Grade 100, or Grade 100LL.

Term	Minimum Antiknock Index	
	ASTM D 4814 Altitude Reduction Areas IV and V	All Other ASTM D 4814 Areas
Premium, Super, Supreme, High Test	90	91
Midgrade, Plus	87	89
Regular Leaded	86	88
Regular, Unleaded (alone)	85	87

### **3.5.2. NFPA Labeling Requirements Also**

**Apply.** -- Each dispenser or airport fuel truck dispensing aviation gasoline shall be labeled in accordance with the most recent edition of National Fire Protection Association NFPA 407, "Standard for Aircraft Fuel Servicing."

NFPA 407, 1990 Edition: Section 2-3.18 Product Identification Signs. Each aircraft fuel servicing vehicle shall have a sign on each side and the rear to indicate the product. The sign shall have letters at least 3 inches (75 mm) high of color sharply contrasting with its background for visibility. It shall show the word "FLAMMABLE" and the name of the product carried, such as "JET A," "JET B," "GASOLINE," or "AVGAS." (NOTE: Refer to the most recent edition.)

### **3.6. Fuel Oils**

**3.6.1. Labeling of Grade Required.** -- Fuel Oil shall be identified by the grades of No. 1, No. 2, No. 4 (Light), No. 4, No. 5 (Light), No. 5 (Heavy), or No. 6.

### **3.7. Kerosene (Kerosine)**

**3.7.1. Labeling of Grade Required.** -- Kerosene shall be identified by the grades No. 1-K or No. 2-K.

**3.7.2. Additional Labeling Requirements.** -- Each retail dispenser of kerosene shall be labeled as 1-K Kerosene or 2-K. In addition, No. 2-K dispensers shall display the following legend:

**3.7.2.1.** "Warning - Not Suitable For Use In Unvented Heaters Requiring No. 1-K."

**3.7.2.2.** The lettering of this legend shall not be less than 12 millimeters (1/16 inch) in height by 1.5 millimeters (1/16 inch) strokes; block style letters and the color of lettering shall be in definite contrast to the background color to which it is applied.

### **3.8. Fuel Ethanol**

**3.8.1. How to Identify Fuel Ethanol.** -- Fuel ethanol shall be identified by the capital letter E followed by the numerical value volume percentage. (Example: E85)

**3.8.2. Retail Dispenser Labeling.** -- Each retail dispenser of fuel ethanol shall be labeled with the capital letter E followed by the numerical value volume percent denatured ethanol and ending with the word "ethanol." (Example: E85 Ethanol)

### **3.8.3. Additional Labeling Requirements.** --

Fuel Ethanol shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

### **3.9. Fuel Methanol**

#### **3.9.1. How Fuel Methanol is to Be Identified.**

-- Fuel methanol shall be identified by the capital letter M followed by the numerical value volume percentage of methanol. (Example: M85)

**3.9.2. Dispenser Labeling.** -- Each retail dispenser of fuel methanol shall be labeled by the capital letter M followed by the numerical value volume percent and ending with the word "methanol." (Example: M85 Methanol)

#### **3.9.3. Additional Labeling Requirements.** --

Fuel Methanol shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

### **3.10. Liquefied Petroleum (LP) Gas**

#### **3.10.1. How LPG is to Be Identified.** --

Liquefied petroleum gases shall be identified by grades Commercial Propane, Commercial Butane, Commercial PB Mixtures or Special-Duty Propane.

#### **3.10.2. Labeling Requirements for Retail Dispensers.** --

Each retail dispenser of liquefied Petroleum gases shall be labeled as "Commercial Propane," "Commercial Butane," "Commercial PB Mixtures," or "Special-Duty Propane."

**3.10.3.** In addition, grades of commercial propane, commercial butane, commercial PB mixtures shall also be labeled "MAY NOT BE SUITABLE AS AN ENGINE FUEL." Grade special-duty propane shall be labeled "SUITABLE AS AN ENGINE FUEL."

#### **3.10.4. Additional Labeling Requirements.** --

Liquefied Petroleum Gas shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

**3.10.5.** NFPA Labeling Requirements also apply. (Refer to NFPA 58.)

### **3.11. Natural Gas**

#### **3.11.1. How Natural Gas Is to Be Identified.** -

- Natural gas shall be identified by Compressed Natural Gas (CNG) or by Liquefied Natural Gas (LNG).



**3.11.2. Labeling the Retail Dispenser.** -- Each retail dispenser of natural gas shall be labeled as "Compressed Natural Gas" or "Liquefied Natural Gas."

**3.11.3. Retail Sales of Natural Gas Sold as a Vehicle Fuel**

**3.11.3.1. Definitions**

**(a). Natural Gas.** -- Natural gas means 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.

**(b). Gasoline Liter Equivalent (GLE).** -- Gasoline liter equivalent (GLE) means 0.678 kilogram of natural gas.

**(c). Gasoline Gallon Equivalent (GGE).** -- Gasoline gallon equivalent (GGE) means 2.567 kilograms (5.660 pounds) of natural gas.

**3.11.3.2. Method of Retail Sale and Dispenser Labeling**

**(a). Method of Retail Sale.** -- All natural gas kept, offered, or exposed for sale and sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE).

**(b). Dispenser Labeling.** -- All retail natural gas 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 5.660 lb of Natural Gas" consistent with the method of sale used.

**3.11.4. Additional Labeling Requirements.** -- Natural Gas automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

**3.11.5.** NFPA Labeling requirements also apply. (Refer to NFPA 52 for CNG and NFPA 57 for LNG.)

**Section 4. Retail Storage Tanks**

**4.1. Water in Gasoline-Alcohol Blends, Aviation Gas, and Aviation Turbine Fuel.** -- No water phase greater than 6 millimeters (1/4 inch) as determined by an appropriate detection paste, is allowed to accumulate in any tank utilized in the storage of gasoline-alcohol blend, aviation gasoline, and aviation turbine fuel.

**4.2. Water in Gasoline, Diesel, Gasoline-Ether, and Other Fuels.** Water shall not exceed 50 millimeters (2 inches) in depth when measured with water indicating paste in any tank utilized in the storage of biodiesel, diesel, gasoline, gasoline-ether blends, and kerosene sold at retail except as required in section 4.1.

**4.3. Product Storage Identification**

**4.3.1. Fill Connection Labeling.** -- The fill connection for any petroleum product storage tank or vessel supplying engine-fuel devices shall be permanently, plainly, and visibly marked as to the product contained.

**4.3.2. Declaration of Meaning of Color Code.** - When the fill connection device is marked by means of a color code, the color code shall be conspicuously displayed at the place of business.

**4.4. Volume of Product Information.** -- Each retail location shall maintain on file a calibration chart or other means of determining the volume of each regulated product in each storage tank and the total capacity of such storage tank(s). This information shall be supplied immediately to the Director.

**Section 5. Condemned Product**

**5.1. Stop Sale Order at Retail.** -- A stop sale order may be issued to retail establishment dealers for fuels failing to meet specifications or when a condition exists that causes product degradation. A release from a Stop Sale order will be awarded only after final disposition has been agreed upon by the Director. Confirmation of disposition shall be submitted in writing on form(s) provided by the Director and contain an explanation for the fuels' failure to meet specifications. Upon discovery of fuels failing to meet specifications, meter readings and physical inventory shall be taken and reported in confirmation for disposition. Specific variations or exemptions may be made for fuels designed for special equipment or services and for which it can be



demonstrated that the distribution will be restricted to those uses.

**5.2. Stop Sale Order at Terminal or Bulk Plant Facility.** -- A stop sale order may be issued when products maintained at terminals or bulk plant facilities fail to meet specifications or when a condition exists that may cause product degradation. The terminal or bulk storage plant shall immediately notify all customers that received those product(s) and make any arrangements necessary to replace or adjust to specifications those product(s). A release from a Stop Sale order will be awarded only after final disposition has been agreed upon by the Director. Confirmation of disposition of products shall be made available in writing to the Director. Specific variations or exemptions may be made for fuels used for blending purposes or designed for special equipment or services and for which it can be demonstrated that the distribution will be restricted to those uses.

## **Section 6. Product Registration**

**6.1. Special Engine Fuels.** -- All special engine fuels that do not meet ASTM specifications or standards addressed in Section 2 shall be registered with the Director on forms prescribed by the director 30 days prior to when the registrant wishes to engage in sales. The registration form shall include all of the following information:

- 6.1.1.** Business name and address(es).
- 6.1.2.** Mailing address if different than business address.
- 6.1.3.** Type of ownership of the distributor or retail dealer, such as an individual, partnership, association, trust, corporation, or any other legal entity or combination thereof.
- 6.1.4.** An authorized signature, title, and date for each registration.
- 6.1.5.** Product brand name and product description.
- 6.1.6.** A product specification sheet shall be attached.

**6.2.** Registration is subject to annual renewal.

**6.3.** Re-registration is required 30 days prior to any changes in Section 6.1.

**6.4.** The director may decline to register any product which actually or by implication would deceive or tend to

deceive a purchaser as to the identity or the quality of the engine fuel.

**6.5.** The registration is not transferable.

## **Section 7. Test Methods and Reproducibility Limits**

**7.1.** ASTM Standard Test Methods referenced for use within the applicable ASTM Standard Specification shall be used to determine the specification values for enforcement purposes.

### **7.2. Reproducibility Limits:**

**7.2.1. AKI Limits.** -- When determining the antiknock index (AKI) acceptance or rejection of a gasoline sample, the AKI reproducibility limits as outlined in ASTM D 4814 Appendix X1 shall be acknowledged for enforcement purposes with the exception outlined in 7.2.4.

**7.2.2.** The reproducibility limits of the ASTM standard test method used for each test performed shall be acknowledged for enforcement purposes, except as indicated in 7.2.1. and 7.2.4.

**7.2.3. Dispute Resolution.** -- In the event of a dispute over a reported test value, the guidelines presented in the most recent version of ASTM D 3244, "Standard Practice for Utilization of Test Data to Determine Conformance with Specifications," shall be used to determine the acceptance or rejection of the sample.

**7.2.4. When Enforcement Action May Be Taken.** -- The Director may initiate enforcement action in the event that, based upon a statistically significant number of samples, the average test result for products sampled from a particular person is greater than the maximum or less than the legal limits (specification value), posted values, certified values, or registered values.

## Appendix E

### Recommendations for a Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory

#### Introduction

The engine fuel testing laboratory is an integral element of an engine fuel inspection program and is generally developed to satisfy the testing requirements as described in the laws and rules of the regulating agency. This document outlines the basic facets of an engine fuels testing laboratory and can be used as a model to initiate or upgrade an engine fuels testing program. Since a fuels testing program is of little value unless recognized standards and methods are utilized, this description of a model laboratory has been developed under the assumption that the universally recognized American Society for Testing and Materials (ASTM) standards and test methods have been incorporated into the laws, rules, and policies of the regulating agency.

This document provides sufficient information to investigate costs associated with the development of a model fuels testing laboratory. Information pertaining to facility needs, recommended ASTM test procedures, test equipment, and the number of personnel required for staffing has been included. Hidden costs associated with the unique working environment of laboratories are often overlooked during initial evaluations; therefore, sections have also been included dealing with quality assurance, safety, and hazardous materials.

Laboratories may be required to perform additional analyses outside the purview of consumer regulations, e.g., analyses pertaining to environmental regulations or tax fraud investigations. This document will not address those areas specifically; however, information presented here may assist in the determination of general costs and requirements.

#### State Operated or Contract

The decision to operate a State testing laboratory, to enter into a contractual agreement with a private fuels testing laboratory, or to have a hybrid of the two depends on a variety of factors: the scope of the program, funding sources, political climate, etc. The question is often asked: "Is there a point at which it is cheaper for a State to operate its own fuels testing laboratory?" The Motor Fuel Task Force assembled in 1984 concluded that a program testing 6,000 samples per year (500 samples per month) is the minimum level to justify building and equipping a fuels testing laboratory.

This estimate remains a valid guideline for determining the practicality of the initial investment for a fuels testing laboratory. However, consideration must be given to the time required for a laboratory to complete the analyses. The value of any inspection program is diminished if laboratory turnaround time is so great that the product is consumed before the results of an analysis are known. If a contract laboratory is chosen, analysis time should be given consideration during negotiations to ensure an effective program; likewise, a State-owned laboratory should be assured the proper resources, e.g., a full staff and well maintained instruments, to be able to meet a satisfactory turnaround time.

#### Laboratory Facility

A fuels testing laboratory requires a unique building designed to accommodate laboratory instruments ranging from a delicate gas chromatograph to octane engines capable of producing severe vibrations. In addition, extremely flammable liquids will be stored and tested throughout the facility. Obviously, the facility design must minimize the chances of explosion and fire and also be capable of withstanding the forces of an explosion. National Fire Protection Association (NFPA) 45, "Standard on Fire Protection for Laboratories Using Chemicals," should be reviewed with contractors to ensure minimum standards are met.

Special considerations should be given to the following:

1. Sufficient ventilation to ensure that workers are not unduly exposed to gasoline fumes or other toxic vapors.
2. Fume hoods and exhaust systems in laboratory areas.
3. Drain lines resistant to acid and petroleum products.
4. Traps to prevent petroleum products from entering the sewer system.
5. Special foundations for ASTM/Cooperative Fuel Research Committee (CFR) engines. It is recommended that sufficient foundations for future expansion be installed during initial construction.
6. Necessary safety equipment, such as fire blankets, fire extinguisher, eyewash stations, etc.

7. Automatic fire extinguishing system for laboratory areas. The extinguishing system's design should include considerations regarding the susceptibility of laboratory instruments to damage when exposed to water or dry chemicals.
  8. An adequate heating, ventilation, and air conditioning (HVAC) system to handle excess heat generated by distillation instruments and octane engines.
  9. A properly designed and sized electrical system.
  10. The laboratory's design must ensure that all fuels testing can be performed in accordance with ASTM requirements. This consideration is especially important for the CFR engines. Volume 05.04 of ASTM Annual Book of Standards contains valuable information regarding the design of a knock-testing laboratory.
  11. Automatic hydrocarbon monitors to warn of critical accumulation of explosive vapors.
  3. General laboratory (70 m<sup>2</sup> [750 ft<sup>2</sup>])
  4. Distillation laboratory 37 m<sup>2</sup> [400 ft<sup>2</sup>])
  5. Shipping and receiving (includes preparation area for empty sample containers) (37 m<sup>2</sup> [400 ft<sup>2</sup>])
  6. Flash point laboratory (19 m<sup>2</sup> [200 ft<sup>2</sup>])
  7. Shop area (23 m<sup>2</sup> [225 ft<sup>2</sup>])
  8. Storage for supplies (23 m<sup>2</sup> [225 ft<sup>2</sup>])
  9. Secured, cooled, and ventilated sample and flammable storage area (23 m<sup>2</sup> [225 ft<sup>2</sup>]). (Insulation and a dedicated ventilation and cooling system should be considered for this room.)
- Total square footage (exclusive of item 1) -- 300 m<sup>2</sup> (3,225 ft<sup>2</sup>). Including offices, bathroom facilities, hallways, etc., the total building size may exceed 372 m<sup>2</sup> (4,000 ft<sup>2</sup>).

Several fixed equipment items are necessary for the laboratory's operation, including:

1. Air compressor and piping of sufficient size to supply the entire laboratory's needs.
2. Gas and water piped to all areas of the laboratory.
3. Storage area for excess fuel after analyses. Depending on the number of samples, this may consist of a properly ventilated storage area with 55-gallon drums to several 500-gallon storage tanks. (Larger tanks may be needed if they are to supplement the program's vehicle's needs.)

The size of the laboratory will depend upon the needs of the agency and the scope of the fuels testing laboratory. The following space listing is for a small laboratory capable of testing approximately 6,000 samples per year. Some space requirements, such as those for octane testing, may seem large, but it is strongly recommended that two additional engine foundations be installed during initial construction.

1. Offices, bathroom facilities, conference room, etc. (as required). No space requirements are listed as this must be determined by the user based on program needs and local building codes.
2. Octane laboratory - designed for four engines (75 m<sup>2</sup> [800 ft<sup>2</sup>])

#### Tests and ASTM Tests Procedures

Careful consideration should be given to the selection of laboratory test procedures since these selections will affect instrument costs, number of personnel, timeliness of samples, and confidence in results. As previously mentioned, ASTM specifications and test methods are universally recognized standards for engine fuels and should be the primary choice for test procedures. The ASTM Subcommittee D 02 on Petroleum Products and Lubricants is responsible for developing engine fuel specifications and is generally comprised of representatives from the petroleum industry, automotive manufacturers, and regulating agencies. This representation ensures that test procedures have been reviewed by each segment of the testing community and laboratory results obtained utilizing these procedures will be widely accepted.

New instrumental methods are often introduced to facilitate testing engine fuels. Chemical methods have been devised to replace or screen physical methods which may enhance efficiency by reducing staff or analysis time necessary to perform physical methods. These methods are normally devised for a controlled environment, such as a processing plant, where the chemical components of the samples are generally known and a correlation between the chemical components and physical parameters may be drawn with confidence. A new laboratory is cautioned to refrain from investing in this instrumentation and the laboratory expertise necessary to perform the test procedure until the test procedure has been approved through ASTM. Screening methods have been employed

by State laboratories to maintain or increase sample coverage. Screening procedures are a deviation of accepted ASTM procedures; certain sections of a procedure may be excluded or modified, such as chilling a sample to the appropriate temperature or accurately timing a distillation analysis. When a screened sample exceeds an predetermined parameter, the sample is analyzed using the proper ASTM procedure. Screening should be discouraged as a means to increase sample coverage. Strategies, such as selective sampling and testing, should be employed as a means for effective regulation.

Following are references to ASTM fuel specifications and testing procedures which form an effective nucleus for an engine fuels testing laboratory with consumer regulatory responsibilities. ASTM test methods listed here do not necessarily exclude other ASTM procedures that are designed for the purpose and that give comparable results. While kerosene is typically not used as an engine fuel, the test procedures are very similar to the diesel test procedures; therefore, many States include kerosene in their jurisdiction for fuels testing. The significance of each of these analyses is included in the ASTM specifications. Asterisks after test methods indicate a preferred method due to cost or ease of implementation.

#### Spark Ignition Engine Fuel Specifications

	<b>D 4814</b>
1. Distillation	D 86
2. Octane (Antiknock Index)	
Research	D 2699
Motor	D 2700
3. Vapor Pressure	
Dry Method	D 4953
Automatic Method	D 5190 *
Mini Method	D 5191 *
4. Oxygenate Content	D 4815
5. Sulfur Content	
X-Ray Spectrometry	D 2622
Microcoulometry	D 3120
X-Ray Fluorescence	D 4294
6. Lead Content	D 3237
	D 5059
7. Workmanship	D 4814

#### Diesel Fuel Specifications

	<b>D 975</b>
1. Flash Point	D 93
2. Distillation	D 86
3. API Gravity	D 1298
4. Sulfur Content	
X-Ray Spectrometry	D 2622
X-Ray Fluorescence	D 4294 *
5. Cloud Point	D 2500
6. Water and Sediment	D 1796

#### Kerosene Specifications

	<b>D 3699</b>
1. Flash Point	D 56
2. Distillation	D 86
3. Sulfur Content	
X-Ray Spectrograph	D 2622
X-Ray Fluorescence	D 4294 *
4. Color	D 156
5. Water and Sediment	D 1796

#### Aviation Gasoline

	<b>D 910</b>
1. Distillation	D 86
2. Water Reaction	D 1094
3. Freezing Point	D 2386
4. Knock Characteristic	D 2700

#### Aviation Turbine Fuel

	<b>D 1655</b>
1. Flash Point	D 56
2. Distillation	D 86
3. Water Reaction	D 1094
4. Freezing Point	D 2386

#### Laboratory Equipment and Supplies

Scientific instrumentation is typically more expensive than initially anticipated even when one has experience purchasing equipment. ASTM has recently approved

methods utilizing automated instruments which may prove to be a better long-term investment when the costs of operating personnel are included.

**Octane Testing**

1 CFR Research Method Engine	\$106,000
1 CFR Motor Method Engine	106,000
1 Fuel Blending System	4,000
Humidity controller for CFR engines	2,000
Complete set of tools	5,000
Lift for removing cylinders	2,500
Supplies, spare parts, etc.	25,000
Total	\$250,500

**Distillation Testing**

2 Explosion proof refrigerators (18 cu ft)	\$5,500
1 Mercury Barometer	350
2 Mechanically refrigerated 4-unit distillation apparatus	8,000
1 Temperature-controlled baths	2,000
Total	\$ 15,850

Note: Automated distillation units (\$20,000 each) may be substituted for the manual distillation units. The increased cost can be justified by a reduced staff and increased precision of the instruments.

**Vapor Pressure (RVP) Testing**

1 Grabner	\$13,000
1 McCleod Gauge	300
1 Vacuum Pump (2-Stage)	350
Total	\$13,650

**Sulfur Testing**

1 X-Ray fluorescence analyzer	\$25,000
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Total	\$25,000
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**Oxygenate Testing**

1 Gas Chromatograph	\$30,000
Total	\$30,000

**Lead Testing**

1 Atomic absorption instrument	\$22,000
Total	\$22,000

**Diesel-Kerosene Testing**

2 Tag-closed cup flash testers	\$3,000
2 Pensky-Martens flash testers	5,000
10 Hydrometers for API gravity	250
1 Saybolt chronometer for color test	1,800
1 Cloud/Pour Point Apparatus	8,000
Total	\$18,050

**Miscellaneous Items**

100 Sample cases for sample transportation	\$14,000
1,200 Sample containers	4,000
1 Oven for drying sample containers (glass)	3,500
1 7.6 liter/hour water still	4,000
1 Analytical balance	3,000
2 Bottle Washers	4,000
Total	\$32,500

**Information Management System**

No recommendations are made for an information management system. However, it should be noted that an information management system is an effective tool to manage data and statistical information when devising sampling strategies and when measuring the general effectiveness of a program.



Minimum requirements for an information management system include a database server and database adequate to handle sample biographical and analyses information. A means to network technicians and staff to the information is necessary to facilitate transfer of information. Considerations for software security and equipment security (limited access to the database server) should be given to ensure the integrity of the data.

Many departments have established information management centers which are consulted for this information. Generally, these departments have a particular protocol for developing an information management system.

### Office Equipment and Supplies

No listing is given since needs are determined by the program's scope. However, the cost of items such as desks, filing cabinets, typewriters, forms, and miscellaneous office supplies must be considered when planning an initial budget.

### Summary

Octane Testing	\$250,500
Distillation Testing	15,850
RVP Testing	13,650
Sulfur Testing	25,000
Oxygenate Testing	30,000
Lead Testing	22,000
Diesel-Kerosene Testing	18,050
Miscellaneous Items	32,500
Information Management System	(as needed)
Office Equipment and Supplies	(as needed)
<b>Total</b>	<b>\$407,550</b>
 Annual Operating Expenses (excluding expenses)	 120,000

### Quality Assurance/Quality Control

The previous sections have addressed structural aspects of an engine fuels testing laboratory: building requirements, testing procedures, and analytical instruments. The management system for a laboratory is as unique as the structural requirements. Quality assurance/quality control programs were originally devised to give statistical verification of analytical results; however, they are now evolving to become the standard management model for laboratories. Chain of custody procedures, sample retention procedures, sample distribution procedures, and documentation of each step has been integrated into the quality assurance program.

The petroleum industry, as well as many other industries, has recently shown an inclination toward the International Organization for Standardization (ISO) model quality assurance program, ISO 9000, which provides guidelines for implementation of a quality system. ISO 9000 addresses fundamental issues of a quality system including the responsibilities of management, necessary documentation, provisions for internal and external audits, personnel requirements, environmental considerations, equipment suitability, traceability, and record keeping. ISO/IEC Guide 25, "General Requirements for the Competence of Calibration and Testing Laboratories," provides an overview of the requirements for an ISO 9000 quality system. There is no accreditation program specifically for State engine fuels testing laboratories and ISO 9000 accreditation is currently quite expensive; however, the ISO 9000 is an excellent model to use in developing a management system.

Regulatory agencies, the regulated industry, and consumers must have confidence in analytical results obtained from the testing laboratory. Statistical verification of obtained results will come through performing tests on internal quality assurance samples (standards, duplicates, spikes, etc.) and exchanging samples with other laboratories. ASTM operates a National Exchange Group (NEG) to distribute fuels among participating laboratories and provides a statistical report of the results. There are three subgroups of the NEG: the Motor Fuel Exchange Group, the Diesel Fuel Exchange Group, and the Aviation Gasoline Exchange Group. Of three types of participation, only two will concern a state laboratory: a "member" laboratory receives monthly samples and agrees to participate in special methods research; and a "quarterly participant" receives two sets of samples every 3 months but is not bound to run special tests. The fee for members or for quarterly participants is \$150 per year. The NEG will provide a means for assessment of quality at the national level. There are also regional groups which provide similar quality assessment exchange programs: Appalachian, Atlantic, Great Lakes, Mid-Continent, Northwest, Pacific Coast, Rocky Mountain, Texas Regional Groups and LA Gulf Coast, Sabine, and Texas City-Houston Subgroups. In addition, ASTM has established the Interlaboratory Crosscheck Program which is an exchange program covering an expanded range of test procedures. If a laboratory is required to perform the full set of ASTM tests listed in the specifications for gasoline, diesel, and aviation gasoline, this particular program will be useful in collecting pertinent quality assurance information.

## Safety Program

A laboratory can be an extremely hazardous work environment, so safety must be integrated into all operations of a laboratory. The Occupational Safety and Health Administration (OSHA) established a requirement effective January 1, 1991, for laboratories to develop a Chemical Hygiene Plan (29 CFR 1910.1450). The guidelines for the Chemical Hygiene Plan were left intentionally general so that an organization's plan could be customized for unique situations in individual laboratories. The Chemical Hygiene Plan details an organization's responsibilities for safety training, supply and maintenance of safety equipment and personal protective equipment, monitoring employee's exposure level to hazardous chemicals, medical consultation and examination, and availability of documents addressing safety procedures and emergency response. The Chemical Hygiene Plan is required to be reviewed annually which provides a format to plan and track improvements.

Reference documents are an essential part of an effective safety program. Safety procedures should accompany and complement testing procedures to ensure an employee is performing functions in an acceptable manner. Emergency response manuals address hazardous or potentially hazardous situations. Proper procedures for handling large spills, evacuation of work areas, and employees who have been overexposed to hazardous materials are typically found in the emergency response manual. Material Safety Data Sheets (MSDS) contain pertinent information regarding the hazards of chemicals and the necessary precautions. These documents should be distributed to employees or located in an easily accessible location.

Coordination with local fire and hazmat departments is essential to ensure rapid emergency response. A chemical inventory and a diagram of the laboratory space is often requested by these departments to expedite their response. Periodic review of the chemical inventory will ensure unnecessary chemicals will be disposed of in a timely manner.

The most effective safety tool is thorough training of employees. Each new employee should be trained with the Chemical Hygiene Plan, safety procedures, emergency response manual, and MSDS's. Subsequent review sessions should be scheduled to ensure familiarity of individual responsibilities and actions. Educational videos are available specifically addressing laboratory safety which can assist in the training process. Hands-on training should be utilized to demonstrate the proper use of fire extinguishers, fire blankets, and other safety equipment in the laboratory. An effective safety program will produce

aware employees who can suggest enhancements to improve the safety of the laboratory.

Personal safety equipment should be provided to all laboratory personnel. Eye protection, lab coats/aprons, and gloves will provide minimum protection. If the use of a fume hood is not practical and an employee is exposed to petroleum or other chemical fumes, organic respirators should be provided to minimize exposure. Determination of which equipment is necessary for handling particular chemicals can be found in the MSDS accompanying the chemicals.

General laboratory safety equipment should be considered during the design or selection of a building. In addition to a good ventilation system, fume hoods should be provided where practical to isolate fumes from the laboratory. Due to the explosive nature of gasoline, even safety equipment needs to be evaluated for safety; for example, explosion-proof motors should be installed to evacuate fumes from a hood. Eyewash stations, fire extinguishers, emergency showers, and fire blankets should all be placed strategically for maximum protection.

In the event of a spill or fire, several safety items will prove useful. Activated charcoal, sold under a variety of names, is effective for absorbing small petroleum spills with the added benefit of quickly reducing vaporization. Other companies offer pads to quickly absorb spills. Similar products are offered to neutralize and adsorb acids and bases. Safety signs should be posted at the entrance of each laboratory room listing possible hazards and restricted activities (e.g., No Smoking, Flammables, Eye Protection Required, etc.). These signs assist visitors and emergency response personnel to identify hazards quickly.

## Hazardous Waste

Engine fuels testing laboratories generate small quantities of hazardous waste. Used oil from CFR engines and waste chemicals from various analyses must be stored and disposed in an appropriate manner. The majority of regulations for storage, disposal, and documentation of hazardous materials may be found in EPA's SARA Title III, 40 CFR 1500. Additional regulations and permits may be required by State, county or municipal agencies. Familiarity with the regulations will be advantageous when considering the design of the laboratory. Specific expenses related to hazardous waste disposal will often be determined by local regulations and the availability of hazardous waste handlers.

## Personnel

The staffing requirements for an engine fuels testing laboratory will be dependent on the number of samples, the number of tests performed on the samples, and the testing instruments chosen. The staff recommended here will be suitable for a laboratory with moderate automation (auto-sampler for the gas chromatograph, automated RVP instrument, etc.) running approximately 6,000 to 8,000 samples per year.

- 1 Laboratory Administrator
- 2 Chemists
- 2 CFR Engine Operators
- 2 Laboratory Technicians
- 1 Clerk

The laboratory administrator should have strong management skills and familiarity with laboratory operations and chemical techniques. The administrator's responsibilities include the development and implementation of the quality assurance program, safety program, and hazardous waste program, as well as providing guidance for the daily operations of the laboratory.

The chemists should have a strong chemistry background and familiarity with instrumental techniques. In addition to normal analytical responsibilities, chemists should assist with the review of analytical results by technicians. Chemists also can assist in the development and implementation of the quality assurance, safety, and hazardous waste programs.

The engine operators are the most difficult positions to fill. The ideal operator will have petrochemical experience with a mechanic's background since the majority of the engine maintenance will be performed by the operators. The petroleum industry estimates approximately 5 years of engine operation is necessary to develop an expertise. To expedite this process, engine operators should periodically attend training workshops. Laboratory technicians should have laboratory experience and a familiarity with scientific methods. Cross training of these individuals is an effective means of maintaining an even workflow through the laboratory.

## Concluding Note

There is no better way to understand the complexities of testing than to visit a state with an active program. Several States, such as Arkansas, California, Florida, Georgia, Maryland, North Carolina, Missouri, Michigan, Washington, and Tennessee (a contractual laboratory) have active programs and are willing to host tours of their

facilities. Interested parties are encouraged to make such a visit.

## References:

John E. Nunemaker, "Planning Laboratories: A Step by Step Process" *American Laboratory* March 1987, 19 (4), 104-112.

Jerry Koenigsberg, "Building a Safe Laboratory Environment" *American Laboratory* June 1987, 19 (9), 96-106.



## **Appendix F**

### **Third Draft - Examination Procedures for Price Verification**

This draft is based on comments received at the 1994 Interim Meeting by the Laws and Regulations Committee of the National Conference of Weights and Measures

#### **Acknowledgments**

The National Conference on Weights and Measures Price Verification procedures are being developed with the cooperation of weights and measures officials from the following jurisdictions who provided background materials, test procedures, and guidance that aided in its development: the City of Philadelphia, Pennsylvania, the City of Seattle, Washington, the States of Kansas, Ohio, Kentucky, California, North Carolina, Texas, Michigan, Wisconsin, Pennsylvania, Florida, New Mexico, Tennessee, Hawaii, Alaska, New Jersey, Massachusetts, Vermont, New York, Nebraska, Arizona, Connecticut, Colorado, Illinois, and Oklahoma. We especially appreciate the technical advice and guidance provided by J. Alan Rogers, Program Manager, Virginia Weights and Measures, and members of the field staff of the Virginia Department of Agriculture, Weights and Measures Section. Special acknowledgement goes to Randy St. John, Jr., Vice President of the Pennsylvania Food Merchants Association, and the members of PFMA's Scanning Certification Board of Advisors for permission to use materials from its "Scanning Certification Program Operations Manual." The weights and measures members of the NCWM Working Group on Price Verification include:

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## I. Background, Findings, and Purpose

The National Conference on Weights and Measures organized the Price Verification Working Group as a subgroup under the NIST Handbook 133 Working Group to respond to nationwide public concern about price accuracy in retail stores. National television and newspaper stories published throughout 1993 accused both retailers and State/local weights and measures officials of failing to ensure that posted prices match advertised and "scanned" prices, and they called for tougher standards. Some reports cited large numbers of pricing errors predominantly in favor of the retailer. The focus of attention of several studies and news stories was directed towards U.P.C. scanning devices even though there is evidence to show that pricing errors are just as likely to occur in stores that use price look-up codes, item pricing, manual key entry, or any other method used to enter prices into a cash register.

### Organizational Meeting

To address this issue, the NCWM invited State and local weights and measures officials, representatives of all major retail trade organizations and retailers from all classes of trade to participate in a Working Group on Price Verification, chaired by Barbara J. Bloch, Special Assistant, Division of Weights and Measures, State of California. Members of the Food Marketing Institute, National Retail Hardware Association, the Pennsylvania Food Merchants Association, seven supermarket companies, and weights and measures officials from several States and Canada attended the first Working Group meeting in Bethesda, Maryland, on June 9-10, 1993. Presentations on scanner and bar code technology, State and local price verifications activities, and industry efforts to ensure price integrity were made by several participants. Based on comments received at the first meeting, the first draft of an "Examination Procedure for Price Verification" was developed and distributed for review and comment.

### Second Meeting

The second meeting was held in Baltimore, Maryland on November 3-4, 1993. Several presentations were made during the first day of the meeting including an "Update on the PFMA Scanner Certification Program" by Randy St. John, Jr., Vice President, Pennsylvania Food Merchants Association (PFMA) and "Price Verification in Texas," Edwin Price, Director, Weights and Measures - Texas Department of Agriculture. Other presentations included "The Retailers Advanced Price Integrity System" by Steve Davis, VP, Merchant Data Services, and "Hand-held Scanning Devices" by Donald Schoen, VP, Retail Management Systems/Telxon. Ken Butcher gave a presentation on the first draft of the "Examination Procedure for Price Verification." The results of discussions of the comments received on the first draft were incorporated in this second draft.

**Uniform Standards for Shelf Price Labels.** - A subgroup under the Price Verification Working Group was formed to determine if there is a need to develop voluntary standards for printed shelf price labels to ensure clarity and accuracy. Dean Ely, Pennsylvania Weights and Measures, was named Chairman of the subgroup. The subgroup was also to determine whether standards for electronic shelf labels are needed so this new technology can be accepted for use in all jurisdictions.

Presentations made at the meeting focused on electronic shelf labels. Chairman Dean Ely discussed the need for clear and accurate shelf labels and introduced a wide range of speakers who introduced the group to the emerging technology of electronic shelf price labels. Presentations were made on "Shelf Label Standards in the PFMA Certification Program" by Randy St. John Jr., VP PFMA, and "Shelf Label Accuracy" by Bob Ricketson, Digidom Research Corporation. The subject of "Electronic Shelf Labeling Technology and Applications" was presented by Deidre Adams, Staff Product Planner, IBM Corp., and Garth Aasen of Telepanel. Other presentations on this subject were made by Doug Etzel, Product Manager, and Mark Hoffman, Director, Human Factors Engineering, of NCR and Charles J. Huebner of Electronic Retailing Systems International.

### NCWM Interim Meeting

The Working Group on Price Verification made a presentation on its work to the Laws and Regulations Committee at the Interim Meetings in Bethesda, Maryland on January 12, 1994. The meeting included a presentation by Mary Bach, a consumer advocate who voiced public concern about the accuracy of retail prices, and Professor Ronald C. Goodstein of UCLA, who reported on his academic studies into the U.P.C. scanner accuracy issue. Industry presentations included an update on the Pennsylvania Food Merchants Association's "Scanner Certification Program" by Randy St. John, Jr., and Jan Charles Gray of Ralphs Grocery Company addressed the negative publicity for retailers which resulted from the media stories on scanner accuracy. Peter Larkin, Vice President of Government Relations for the Food Marketing Institute presented industry comments on the draft Examination Procedure for Price Verification and expressed support for the work that the NCWM had accomplished in developing uniform test

procedures. A technical presentation and equipment display on hand-held scanning devices was provided by Jack O'Malley of BASS Inc.

Based on the oral and written comments received on the second draft at the Interim Meeting the Laws and Regulations Committee will make the report and recommendations of the Price Verification Working Group information items and carry them over for field testing and study by the NCWM. A third draft of the Examination Procedure for Price Verification will be included in the Interim Meeting Report. The L&R Committee will ask weights and measures officials to field test the Examination Procedure over the next year in order to evaluate its effectiveness.

**The Laws and Regulations Committee will make a presentation on the recommendations and activities of the Price Verification Working Group before the 79th National Conference on Weights and Measures on July 12, 1994, in San Diego, California.**

**Background:** The Price Verification Working Group studied information obtained from a survey of weights and measures jurisdictions from across the country, as well as academic, government, and industry studies dating back to 1965, media stories, and news articles, and made the following findings:

From information received from weights and measures jurisdictions, the Working Group found that:

- At least 20 States have developed and use formal procedures that provide sampling and inspection guidelines to ensure that inspections are uniformly and routinely conducted. Twelve more States responded that they have only sketchy or informal test procedures or policies to guide their inspectors.

- For those States that have documented procedures, the definition of a "good" inspection result ranges from 90 to 100 percent accuracy on sample sizes ranging from 10 to 300 packages. Most procedures do not provide guidance for inspectors to "balance" inspections between "sale" and "nonsale" items, commodities offered for sale from bulk, or from meat counters where coded prices are generated by scales in the store. Some jurisdictions also look at the total monetary value of overcharges on the sample lot or individual packages and consider this factor in their judgement of what constitutes a good or bad inspection.

- Only a few States provide specific guidance to inspectors on inspection frequency and when to target price accuracy inspections for the most effective use of inspector time.

- The type, degree, and timing of enforcement actions or follow-up inspections vary widely across the country. Some States limit their actions to requiring immediate correction of the prices found to be incorrect, while other jurisdictions have guidelines for follow-up inspections and subsequent enforcement action based on the level of inaccuracy found on follow-up inspections. At least one State and several cities have the authority to require item pricing by firms with high inaccuracy rates on consecutive inspections.

- Some States report that they focus their price inspections on food stores because they lack resources to expand their efforts beyond establishments where they conduct other inspections for net contents and scale accuracy. This situation exposes food retailers to increased scrutiny and legal action for having price errors on the packages inspected, while other types of retailers are not held to the same standard. This may be a nationwide problem; one State reported an inaccuracy rate of 3.8 percent for supermarkets and an 8 to 11 percent inaccuracy rate in hardware and convenience stores.

- Some jurisdictions reported compliance rates of 98 to 100 percent, but indicated that they only conduct inspections in response to consumer complaints. On the other hand, several officials indicated that they had never received complaints about stores that had a history of poor compliance. This is consistent with experience weights and measures officials have had in other areas of enforcement.

- Some weights and measures programs report that they are unable to perform this type of inspection or increase current activities to include all types of retail stores because of dwindling resources and budgets. This is unfortunate because it provides fertile ground for accidental or intentional fraud that harms consumers and reputable business people alike. The Working Group believes that this problem will increase unless there is legislative and financial support for weights and measures programs to conduct routine inspections to ensure accurate pricing.



- There was overwhelming support from State Weights and Measures Directors for development of a NCWM examination procedure for price verification, and the majority agreed that it should be a priority issue on the agenda of the Laws and Regulations Committee.

#### Other Findings:

- Errors in pricing are often the result of simple human error. Regardless of their cause, pricing errors hurt consumers and business alike. Stores lose profits on undercharges and consumers lose on overcharges, and inaccurate prices frustrate value comparisons. Overcharges and undercharges are believed to be primarily caused by poor pricing practices and ineffective management control, not intentional acts to defraud consumers. However, those retailers with poor price integrity have not had strong incentives to improve their pricing practices.

- Some studies indicate that error rates on manually entered prices may range from 6 to 15 percent. Pricing errors may occur on any transaction so inspection programs must include procedures that would allow manual price entries to be validated by the store and tested for compliance by the regulatory agency.

- One of the major frustrations to consumers that the media stories identify is the failure of some stores to correct pricing errors promptly. One news story reported that as many as ten purchasers had reported to a store's personnel that they had been overcharged on some products without the prices being corrected. This has led a few regulatory agencies to impose stringent enforcement action when the same pricing errors are found on a follow-up visit.

- Results from at least one study tested the assumption that prices are more likely to be correct several days into a sale because the store would have had ample opportunity to identify and correct the errors. Results from the study indicate that the day of purchase has little impact on errors. This indicates that stores involved in this study have no validation or correction procedures once prices are supposedly changed.

- Failure to use random sampling techniques, nonuniform test procedures, and/or small sample sizes result in misleading information regarding the overall accuracy of prices in retail stores. These factors combine to hide the economic impact of pricing errors on consumers and business (e.g., it would be misleading to conclude that a store with 40,000 items overcharges on 4,000 items if the statement was based on a 10 percent error found on a sample of only 10 sale priced items.)

- Accuracy tests conducted in jurisdictions that require item pricing indicate that errors in price accuracy range from 4 to 7 percent. This indicates that the former general practice of applying a price to every package, widely replaced by scanner technology, suffers from high or higher rates of error than the scanner technology.

Based on its findings, the Working Group is especially concerned that consumer confidence in business and government will be damaged if positive action is not taken on a nationwide basis. Confidence in business is eroded by press reports of poor pricing practices in what were thought to be reputable stores, and eroded in government when the public cannot take for granted that all State and local agencies are involved in working with retailers to ensure pricing accuracy.

Investigations conducted by State and local weights and measures officials, (though some are limited in scope and all are based on a variety of test procedures) and reports published in magazines, other media and television, along with other studies, indicate that the accuracy of retail prices should be a nationwide concern and the establishment of programs that ensure the accuracy of prices in all retail stores should be a national priority.

## II. Scope of Work

The Working Group identified the following issues to be addressed:

1. **Ensure Equal Coverage of all Types of Retail Stores.** - All types of retail stores, including grocery, hardware, general merchandise, drug, automotive supply, convenience, and club stores, should be routinely inspected for price accuracy.
2. **Uniformity.**- Nationally recognized test procedures should be developed and used in all jurisdictions. All jurisdictions should be urged, and industry asked, to support adoption of standards to ensure that inspections are conducted uniformly across the country. These test procedures should include:

- Procedures for determining and selecting samples (number of items checked). Procedures should allow inspectors to use manual techniques or hand-held scanning devices to conduct inspections.
  - "Randomized" sampling to reduce inspection time and ensure unbiased results.
  - Guidelines to identify groups of merchandise to be checked, including sale, non-sale, advertised specials, cents-off, direct delivery, bulk, price look up and end-aisle displays.
3. **Prioritize Development of Procedures.** - A basic procedure appropriate for retail food stores should be developed and modified to fit the pricing and merchandising practices of other retail stores.

The following priorities were established:

1. Food Stores
  2. General Merchandise Department Stores
  3. Drug and Convenience Stores
  4. Hardware & Automotive Supply Stores
  5. Other Retail Stores
4. **Inspection Reports.**- Model inspection reports should be developed for use to promote the collection of uniform, consistent data.
5. **Compliance Criteria.**- Define "error," "violation," and other terms specific to this type of inspection and recommend accuracy requirements.
6. **Frequency of Inspection/Reinspection.**- Determine guidelines for conducting follow-up inspections and for conducting surveys to identify problem stores.
7. **Model Legislation.**- Amendments to the Uniform Weights and Measures Law may be needed to ensure that retail price verification is conducted according to uniform standards and procedures.
8. **"Good Pricing Practices".** - Industry should be encouraged to develop and follow "good pricing practices," such as maintenance of data integrity, update of price changes in a timely manner, cross-checks, and communication.

"Price Verification" versus "Scanner Accuracy": The Working Group does not believe that there is a problem with scanning devices or computers. The Working Group agreed to term this type of inspection "price verification" to make it clear that it is not solely a "scanner"-related issue.

### III. Uniform Law for Price Accuracy

Comments received on the first and second drafts of the "Examination Procedure for Price Verification" (First Draft), indicate that the current wording in Section 16. Misrepresentation of Pricing is effective and has been used in numerous legal actions with no reported problems. Therefore, no changes are recommended. Jurisdictions considering legislation in this area may wish to adopt Section 16, presented below.

#### Section 16. Misrepresentation of Pricing

No person shall misrepresent the price of any commodity or service sold, offered, exposed, or advertised for sale by weight, measure, or count, nor represent the price in any manner calculated or tending to mislead or in any way deceive a person.

#### Inspection Authority

Comments on the First Draft received from several jurisdictions expressed concern that the scope and requirements of their laws would not permit them to conduct a price verification inspection on any product sold by other than weight or measure. Another

concern was lack of authority to conduct inspections of prices if a store's point-of-sale system is not attached to a scale or measuring device.

To address these concerns, the Working Group recommends amendments to the Uniform Weights and Measures Law to ensure that weights and measures programs in State and local governments have the authority to conduct retail price verification inspection in all types of stores on a routine basis according to uniform standards and procedures. This recommendation is based on similar requirements contained in the Weights and Measures Laws of the States of Virginia, Massachusetts, and California.

#### **I. Proposed amendments to the Uniform Weights and Measures Law:**

Add a new requirement to Section 12 to give the State Director of Weights and Measures authority to adopt uniform test procedures to verify advertised prices, test "point-of-sale" devices, and conduct inspections.

##### **Section 12. Powers and Duties of the Director**

The Director shall:

(q) Verify advertised prices, price representations, and point-of-sale systems, as deemed necessary, to (a) determine the accuracy of prices and computations and the correct use of the equipment, and (b) if such system utilizes scanning or coding means in lieu of manual entry, the accuracy of prices printed or recalled from a database. In carrying out the provisions of this section, the director shall (1) employ recognized procedures, such as are designated in National Institute of Standards and Technology Handbook 130, "Price Verification," (2) issue necessary rules and regulations regarding the accuracy of advertised prices and automated systems for retail price charging (referred to as "point-of-sale systems") for the enforcement of this section which shall have the force and effect of law, and (3) conduct investigations to ensure compliance.

Add the following definition to Section 1. Definitions. --

**Point-of-sale system.** - A point-of-sale system includes cash registers or devices and systems capable of recovering stored information related to the price of individual retail items.

#### **II. Penalties**

Comments received on the first and second drafts indicate that the penalties already contained in the Uniform Weights and Measures Law have proven effective in formal enforcement actions relating to price verification violations. A majority of the comments strongly supported the use of civil penalties, consent agreements, or other administrative remedies to resolve violations. At least two jurisdictions report that they also recover the cost of investigations as part of consent agreements. Several people suggested that consent agreements could be used to require a store to have full-store pricing audits conducted on a frequent basis (reports could be sent directly to the jurisdiction for review) for a period of time. This approach would save resources for jurisdictions and immediately improve price accuracy in the store.

The Working Group recommends that jurisdictions that do not have authority to impose civil penalties under their current law adopt Section 23. Civil Penalties in the Uniform Weights and Measures Law. The blank spaces are provided to allow jurisdictions who adopt the section to set monetary values according to State or local requirements. Section 23 is presented below for information.

**Section 23. Civil Penalties.** -- Any person who, by himself or herself, by his or her servant or agent, or as the servant or agent of another person, commits any of the acts enumerated in § 22 may be subject to a civil penalty.

**23.1. Civil Action.** -- A civil action may be brought by the director in any court of competent jurisdiction to recover a civil penalty of: (a) not less than \$\_\_\_ nor more than \$\_\_\_ for a first violation, (b) not less than \$\_\_\_ nor more than \$\_\_\_ for a second violation within 2 years from the date of the first violation, and (c) not less than \$\_\_\_ nor more than \$\_\_\_ for a third violation within 2 years from the date of the first violation.

**23.2. Administrative Hearing.**-- The director or his/her designee shall be authorized to conduct an administrative hearing and, upon notice and an opportunity to be heard, may assess a civil penalty of (a) not less than \$\_\_\_ nor more than \$\_\_\_

for a first violation, (b) not less than \$\_\_\_ nor more than \$\_\_\_ for a second violation within 2 years from the date of the first violation, and (c) not less than \$\_\_\_ nor more than \$\_\_\_ for a third violation within 2 years from the date of the first violation upon the finding of a violation of any provision of this Act. The decision of the director shall be subject to appropriate judicial review. Any civil penalty collected under this Act shall be transmitted to the state treasurer, who shall credit the same to the \_\_\_\_\_ fund.

## II. Other Comments

Few weights and measures officials, consumers, or industry representatives supported NCWM adoption of requirements (1) to establish voluntary requirements for shelf tags, (2) extend weights and measures supervision to include cash registers not attached to weighing and measuring devices, (3) or require retailers to provide consumers with materials to mark or verify prices on their own initiative while they shop.

The Working Group agreed that the focus of recommendations from the group should allow weights and measures programs and retailers to focus their resources and efforts on ensuring that price representations agree with the prices charged at the checkout counter. Therefore, the Working Group did not propose additional regulations in these areas.

## IV. Examination Procedure for Price Verification in Food Stores

### 1. Scope

This Examination Procedure outlines the steps for conducting price verification inspections in a wide variety of stores, including those that use Universal Product Code (U.P.C.) scanners and price-look-up code entries at the checkout counter as the primary means for pricing. A special test procedure is included for test purchases and for verifying manually keyed entries. The purpose of these procedures is to ensure that consumers are charged the correct price for the items purchased.

This Examination Procedure for Price Verification provides weights and measures administrators with the tools, guidance, and background information, as well as uniform test procedures and enforcement practices, to enhance the economic well-being of consumers and retail businesses in the jurisdiction. By implementing these procedures in cooperation with industry, weights and measures officials will help to restore and maintain consumer confidence in retail pricing practices and technologies, such as scanners, for the benefit of consumers and the business community alike.

The control that good management maintains to avoid price misrepresentation is essential for ensuring its "store pricing integrity" - that is, ensuring that all prices advertised or marked in the store consistently match prices on file in the computer system or are keyed in accurately by register operators. This requires management to understand its legal obligations and make a full commitment to "price integrity." Management must also be willing to commit sufficient resources throughout the organization to meet these obligations.

No general assumptions can be made about the accuracy of price in any type of retail store. Every store must be considered on a case-by-case basis because the "accuracy" of prices in a store depends on the policies, practices and procedures implemented by the personnel and management at each location.

The evaluation of the "accuracy" of prices must be based on the verification of all pricing methods used in the store, not just the accuracy of "scanner" prices. Stores that use "scanners" may also use price-look-up codes and manually entered prices to charge for items. These procedures provide sampling procedures and compliance criteria that are suitable for use in a wide variety of food stores (procedures for other types of stores will be based on this outline) and utilizes a combination of "randomized" and/or "stratified" sampling to reduce bias in the selection process while ensuring that specific groups of items are included in the inspection sample. This approach will ensure that the test results provide an overall picture of a store's pricing practices.

As stated above, price accuracy is dependent on the control and procedures followed in each individual store. Therefore, routine inspections are necessary to ensure that control of price accuracy is maintained. As with other weights and measures inspection activities, enforcement agencies should build a history of compliance for each store based on the inspection results and an evaluation of management commitment to compliance and control as shown by the level of supervision and training provided for employees.



The enforcement procedures recommended for price verification follow the historic weights and measures approach of working with regulated firms to achieve voluntary compliance through an "inform, warn, action" process to enforcement actions. This approach has proven effective in gaining high levels of compliance with other laws relating to accuracy in commercial measurements.

## 2. Test Notes

**Safety and Health** - You must follow safe work practices when conducting inspections to avoid personal injuries or property damage. Be aware of and follow safety or health rules in effect at the inspection site and be especially sensitive to the safety and health of consumers encountered during the inspection process. Special care should be taken when handling perishable or frozen foods (to avoid defrosting frozen products or allowing dairy products to warm to room temperature) and when working in food areas such as the deli, meat room, or bakery.

**Confidentiality of Findings** - Avoid making statements concerning the results of price verification tests to consumers or unauthorized employees of the store. This is important because liability for your jurisdiction might result if the reputation of the store is harmed by improperly released information. Inspection findings are confidential and are not final until the results are confirmed and discussed with the store's manager or other representative. Any request from the public for the results of the inspection should be referred to your supervisor.

## 3. Materials and Equipment

The following equipment is recommended for use in conducting the inspections described in this outline:

- Calculator
- Inspection Report
- Copy of laws and regulations governing the inspection
- Hand-held counter or Price Verification Tally Sheets (used to tally the number of items sampled)
- Post-It Notes™ (100 count pad), [38 mm x 50 mm (1.5 x 2 in)] for marking items with price and aisle location for easy restocking or in following up on errors that may be found
- 1 lb (or 1 kg) test standard
- merchandise cart (if required)

**Other equipment and materials provided by the store when available:**

- Current newspaper advertisement or store sales brochures
- Hand-held scanning device(s) for verifying price accuracy. These include portable scanning devices that either store the item information for later comparison with the store's point-of-sale database; are loaded with the prices stored in the point-of-sale data base for quick retrieval, or devices in direct FM radio contact with the point-of-sale database. These units display the price and other product information immediately. Stores are not required to have this type of equipment or to make it available for your use. However, many stores use this type of equipment to help them maintain price integrity and many have indicated that they will voluntarily make it available for use in price verification testing. Studies indicate that stores that use this type of equipment have lower error rates.

Comments received from weights and measures officials expressed concern about using this type of equipment. Most of these concerns can be eliminated through exposure to and use of a hand-held scanning unit. With just a few minutes of instruction and explanation you will find the equipment accurate, reliable, and very useful. Several jurisdictions already use this equipment and consider it an essential tool to enhance both the accuracy and speed of the verification process. The Working Group will make a concerted effort to provide technical information on this equipment at both State and Regional Weights and Measures Association meetings. If you are using a hand-held scanning device and find an error, you can take the item in question to a register and have it scanned to confirm the error so that there is no question that the item would have been incorrect at the time of purchase by a consumer. (Notes: prices on more than 200 items can be verified in less than 1.5 hours with these devices. Equipment suitable for one store cannot be easily used in another, so jurisdictions cannot purchase equipment for use in all inspections.)



As more and more jurisdictions have tried out the draft procedures they have commented that stores are offering to let inspectors use the hand-held scanning devices with either sampling plan to reduce inspection time. The use of the hand-held devices in the inspection is encouraged as more and more stores are turning to these devices to help them maintain price integrity.

#### 4. Definitions

**"Cents-Off" Representation.** - Any printed matter consisting of the words "cents-off" or words of similar import (e.g., 15% off, bonus offers, 2 for 1 or 1 cent sales, 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 selling price.

**Direct-Store-Delivery (DSD) Item.** - An item delivered to the store, and usually priced, by route salespeople (e.g., milk, beer or soft drinks, bread, snack foods such as potato chips).

#### Displays.-

**Aisle Stacks or End-of-Aisle Displays.** - Displays located in freestanding units or attached at the end of or adjacent to a tier of shelves.

**Tie-in Displays.** - Displays of complimentary products at locations in a store.

**Multiple Displays.** - Displays of the same product at several locations in a store.

#### Enforcement Actions. -

**Lower levels of enforcement actions.** - Include increased frequency of tests, stop-sale or correction orders issued by inspectors, administrative hearings, warning letters and other notifications of noncompliance.

**Higher levels of enforcement actions.** - Include the issuance of citations, imposing civil or administrative penalties, and criminal prosecution under misdemeanor or felony statutes.

#### Inspection Frequency. -

**Normal Inspection Frequency.** - An inspection that is made at the usual or customary time interval used by an enforcement agency. Inspections can be conducted during the normal business hours of the store. Stores under this frequency should be inspected for price accuracy on a semi-annual or annual basis.

**Increased Inspection Frequency.** - Inspections made more often than the usual or customary time interval, usually as a follow-up to a prior history of problems. Inspections can be conducted during the normal business hours of the store. Stores under this frequency should be inspected for price accuracy on a quarterly, bi-monthly, or more frequent basis.

**Term of Increased Inspection Frequency.** - When a store has been placed on an increased inspection frequency, it shall remain at that frequency until such time as there are two consecutive inspections with errors at Level One (e.g., 98% or higher accuracy) not including the two follow-up inspections conducted according to the following recommendations.

**Special Inspection.** - An inspection that is made as a follow-up to a prior inspection, to investigate a complaint, or to respond to a serious level of inaccuracy.

*Note: After a price verification program has been in place for a period of time and a database is established, procedures can be developed to randomly select stores for inspection and target inspections on areas of low levels of compliance to increase the effectiveness of the program.*

**Inspection Lot.** - The group of items available for testing. (In some stores this can range from 10,000 to 70,000 items.)

**Not-on-File Item.** - Items scanned or keyed at a cash register and not found in the database. Items not-on-file are not errors.

**Notification of Noncompliance.** - A written notice given to a store describing the violations of the law that were found to exist. The notice can include information on the action that you intend to take or specific corrective action that is required to be implemented and may include deadlines for compliance. This information should also be sent to the firm's president or chief executive officer.

**Price Look-Up Code (PLU).** - A pricing system where numbers are assigned to items or commodities and the price is stored in computer memory for recall when the numbers are manually entered by a clerk. PLU codes are used with scales, electronic cash registers, and point-of-sale systems. PLU codes vary from business to business and may not be consistent for the same product. Stores that use point-of-sale scanners may use manually entered prices or PLU codes in 15 percent or more of their transactions.

**Store-Coded Item.** - The application of U.P.C. codes to items in the store. Scales in the meat, deli and other departments generate U.P.C. labels that include product identity and price information that is read by point-of-sale scanners.

**Prices.** - These definitions apply to this procedure only and do not affect the provisions of any other procedure.

**Misrepresented Price.** - A price is misrepresented when the price charged is different than the price at which the item is offered, exposed, or advertised for sale, or different than the price on the item, shelf label or sign.

**Price Charged.** - The price charged for an item and either displayed on the automated device or on the receipt issued by the device, whether the item is scanned and voided, actually purchased, or the device is computing or recording while in a training or inspection mode.

**Overcharge.** - An overcharge exists when the price charged for an item is more than the lowest advertised, quoted, posted, or marked price.

**Undercharge.** - An undercharge exists when the price charged for an item is less than the lowest advertised, quoted, posted, or marked price.

**Intentional Undercharge.** - An undercharge that occurs when store lowers the price in the database in anticipation of selling the item at the reduced cost. Undercharges found within 24 hours of the price change are not counted as errors. This procedure is used by some stores to avoid overcharging consumers while shelf or item price tags are changed.

**Pricing Coordinator.** - The individual designated by the store to control and maintain "pricing integrity" in the store (also called a "scanner coordinator").

**Pricing Integrity.** - Ensuring that the computer price file and/or the price charged to consumers at a cash register is the same price that is marked on the product, in an advertisement, and/or the shelf tag.

**Merchandise Group.** - A group of products identified under a common heading for inspection purposes only (e.g., "advertised sale" items, "end-of-aisle" items, "direct delivery" items, or "cents-off" items).

**Sample.** - The group of items selected for testing purposes from the inspection lot.

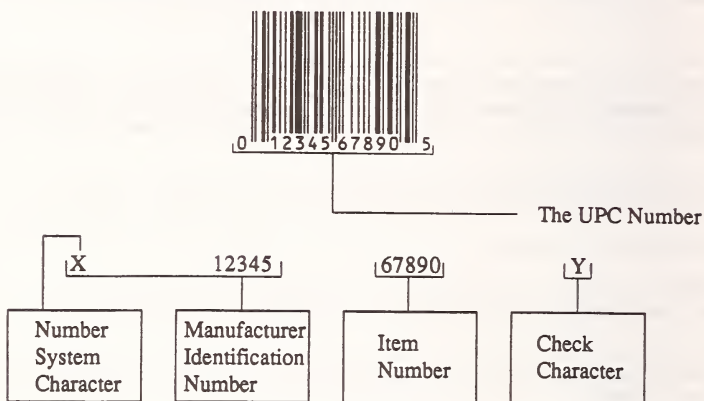
**Scanner.** - An electronic system that employs a laser bar code reader to retrieve product identity, price and other information stored in computer memory. Scanner technology provides an accuracy of 99.9 percent or better.

**Stock-Keeping Unit (SKU).** - A system of product identity and pricing similar to PLUs.

**Stop-Sale Order.** - An official document placing off-sale a package or amount of any commodity which is offered or exposed for sale in violation of the law.

**Universal Product Code (U.P.C.).** - Generally defined as a unique symbol that consists of a machine readable code (vertical bars of varying thickness) and human-readable numbers. U.P.C.s are incorporated into package graphics or are applied with tags or labels. The U.P.C. symbol typically found on items in stores is a 12-digit identification of the individual product.

## Structure of the Universal Product Code Number



The 12-digit number is divided into three parts. The first is a six-digit Manufacturer Identification Number that is assigned by the Uniform Code Council (UCC). This is followed by a 5-digit product item number assigned by the manufacturer or seller to identify a specific product and package size. Each of the 5-digit codes is a non-repetitive number unique to the product it identifies. The final digit is a check digit that is used by the computer system to check the accuracy of the entire U.P.C. number whether entered by an operator or read by a scanning device. U.P.C. codes can also be generated for random weight packages by price computing scales. U.P.C. symbols must meet the standards established by the UCC in order for them to "scan" accurately. The size and clarity of the print and clear area surrounding the symbol are a few of the factors that affect accuracy.

The UCC is administered by a board of governors, which consists of representatives from various industries including food retailing, distribution, and manufacturing. The UCC issues codes and answers technical and other related questions. For more information contact the Uniform Code Council, Inc., 8163 Old Yankee Road, Suite J, Dayton, Ohio 45458. Telephone: 513-435-3870.

## 5. Pre-Inspection Tasks

Prior to conducting an inspection it is recommended that you contact the store management, identify yourself, state your affiliation, and explain the purpose of your visit. Offer to explain how the test will be conducted, how errors are calculated, and how the results will be evaluated. Determine if there are any special health or safety rules that should be followed. If requested, provide the manager with information on the laws authorizing the inspection activity and the name, address and telephone number of your supervisor in case questions arise concerning your visit or findings that you provide in your report.

- Invite the store manager, pricing coordinator, or other representative to participate in the inspection if they are available.
- Determine if the store has a hand-held scanning device available for use in the inspection. If one is available, request instruction on how to operate it properly. In some stores the "pricing coordinator" may offer to operate the scanning device and participate in the inspection, which is acceptable.
- If a manual inspection procedure is being followed, advise the manager that you will restock the merchandise selected for testing. Some stores managers want their own personnel to reshelve the items, which is acceptable. Determine which cash register should

be used to conduct the inspection. Arrange to have the register set up so that the items will not be included in sales records and avoid access to cash drawers.

- Inspection activities should be conducted in a manner that does not disrupt the normal activities of the business or interfere with consumers who are shopping or checking out.
- If you intend to conduct a manual test, determine if the store allows direct-store-delivery (DSD) items to be priced by a delivery person. Identify the types of items priced in this manner so that they can be included in the sample.

## 6. Inspection

In addition to conducting a price verification test, you should perform the following inspections:

- Determine if customer displays on point-of-sale systems conform to NIST Handbook 44, General Code, User Requirement, 3.3 Position of Equipment. - "A device equipped with a primary indication element and used in direct sales shall be so positioned that its indications may be accurately read and the weighing and measuring operation may be observed from some 'reasonable' customer position."

NIST Handbook 44 defines "point-of-sale system" as "an assembly of elements including a weighing element, indicating element, and a recording element, (and may be equipped with a 'scanner') used to complete a direct sale transaction."

At locations using scanners, the importance of consumer access to the cash register display of product information and price cannot be overstated. If consumers cannot verify prices as the items are being scanned, they must wait until the transaction is completed (e.g., they must pay by cash or check) before they receive the receipt so they can confirm the prices charged for the items.

- Verify the accuracy of information provided on cash register receipts.
- Shelf Labels (optional inspection based on local requirements) - Conduct this inspection if your jurisdiction has specific laws or regulations relating to shelf labels, unit pricing, or other pricing requirements.

## 7. Test Procedures

**Application:** These procedures may be used to conduct inspections of a store whether the store uses scanners, automated price look-up registers, or where a clerk manually enters the prices.

### Notes on Sampling Plans

- For Normal or Increased Inspection Frequency Inspections - Follow the test procedures described in Part I, II, or III.
- For Special Inspections - Follow the test procedures described in Part I or II, or use the procedures in Part III "Procedure for Conducting Test Purchases and for Verifying Manually Entered Prices," and include the individual items identified as a result of a consumer complaint or as a follow-up to specific errors found on previous inspections.

**Stratified Sampling by Merchandise Group** (e.g., selecting samples of items on sale, "cents-off" specials, manager specials, or end-of-aisle items): This method is used in connection with the sampling plans described below, but it is not the sole basis for sample collection because (1) a specific list of predetermined items does not look at the store as a whole. Experience shows that price errors can occur on any item in a store. Errors occur on regular and sale items, but no particular merchandise groups of items are consistently found in error. (2) Focusing on specific items consumes excessive time to search the store unless you are investigating a complaint or following up on a prior history of noncompliance. (3) It is difficult to create a list of groups that would be found in all stores or is easily identifiable. (4) It is possible after successive visits for store personnel to know ahead of time that you will only focus on specific groups.



## **"Randomized" Sampling**

A "randomized" approach is used because all items from the inspection lot in the store have an equal chance of being included in the sample. This approach is recommended because it (1) reduces bias and saves time since you do not have to decide which items to select; (2) you are guided to select items both horizontally and vertically along the shelves to avoid the common practice of selecting items only at eye-level; (3) it is more representative because the sample items more closely reflect the population; and (4) it is simple to use.

Field experience shows that the "randomized" sampling procedures described below provide good results. The sample will include a wide variety of items, including those with regular and reduced prices and others identified as being susceptible to frequent inaccuracies in some circumstances. The term "randomized" is used since the procedures are not truly random. A purely random approach would be too time consuming and impractical for everyday use.

Samples of certain merchandise groups are collected in the first stage of the two-stage manual sampling plan described in Part II because the intent of this plan is to be sure to focus on merchandise groups that have been identified as potential areas for errors. Most inspectors will prefer to utilize the "randomized" sampling techniques in Part I as a simple way to conduct a thorough inspection of a wide range of merchandise groups.

### **Sample Size**

Three factors were considered in determining sample size - the inspection lot size (number of items for sale in a food store), degree of accuracy required, and time constraints. Different sample sizes are used depending on whether manual procedures are followed or whether a hand-held scanning device is available for your use in the inspection.

### **Part I. Single-Stage (Automated) Test Procedure**

This method involves the use of a hand-held scanning device that may display the price, identity, and other information on the product, permitting immediate verification of the price.

This test procedure has several benefits including: (1) It is more effective in its coverage and is simpler to do because you select items by count following a systematic pattern throughout the store. (2) The larger sample size ensures that a wider range of items are tested, which provides increased scrutiny, hence confidence in the results is improved. (3) The results can be evaluated for accuracy as well as providing sufficient information for computing the ratio of overcharges to undercharges.

**Sample Size:** A sample size of at least 200 items is used. A larger sample size is recommended if time and resources permit.

**Test Procedure -** No test procedure will work perfectly in every retail store arrangement. You must modify the plan to fit the differences unique to each store while following the minimum sample size and randomized selection procedures in this outline. Typically, with a sample size of 200 items, 4 or 6 items from each side of every aisle will be selected. Since store sizes differ, this number will vary, but samples will be taken from a wide variety of items (and merchandise groups) from locations throughout the store. Experience shows that the sample will include regular and sale priced items, manager specials, direct delivery, and end-of-aisle items due to the sheer size of the sample.

**Note:** See Detailed Illustration of the Randomized Sampling Procedure on Page 277.

The specific steps of the randomized sampling procedure are:

1. Count the number of aisles and stand-alone displays in the store which carry products that are to be tested:
  - Stand-alone counters and displays or whole departments (e.g., bakery or seafood, etc.) are grouped together and counted as an "aisle" to be sampled.
  - Ends of aisles are considered as a single, separate "aisle" and tested separately (see item 8).



2. The number of groups (e.g., 31) is divided into the sample size (200 items) to determine the number of items to be sampled from each side of each aisle (e.g., 7 items).

3. Start in any convenient location in the store on the top shelf of either side of a randomly selected aisle. Begin with the first item starting from the front or back of the store, count 15 items horizontally along the top shelf. The 15th item is the first item selected. Only select one item from each brand or product (if they are the same size and price) from a display that has two or more packages of the same product, size and price sitting side by side.

4. Check the price with the hand-held scanner and count the item using a hand counter or tally sheet. If the item is incorrect, record the name, description, and price of the product along with any other information (e.g., the product is on sale, location for easy relocation to verify the error, etc.). If the device uses a "batching" file, sample the items and have the store's price coordinator download the files to the computer and obtain a printout of the discrepancies for follow-up. Some jurisdictions require inspectors to document that items will be mispriced at the checkout. If you want to confirm and document that the error will occur at the checkout, take the item to a register and have it scanned and obtain a receipt.

5. From the first item sampled, drop down one shelf to the item most directly below and count 15 items in the same direction and sample that item. After the number of items to be selected for each aisle are selected, go to the next aisle and start on the next shelf either down or up from where the previous sample was selected and count 15 items and sample the 15th item until the required number of samples is selected. If you have sampled an item on the bottom shelf and have more items to test on the aisle, simply go back up one shelf. This will create a "zigzag" trail up and down the side of the aisle.

Note: Randomness can be increased by starting on different shelves or at the midpoint, or rear of an aisle during an inspection, or by starting at different locations in a store on subsequent inspections. Always start at a different location on subsequent inspections of a store.

6. This procedure is repeated for all aisles, end-of-aisle, or stand-alones or displays.

7. When these areas are completed, PLUs and store-coded items are sampled. Be sure to include items on display outside the store if they are available (e.g., bark mulch and gardening items).

*Note: To maintain "randomness" do not search for obvious pricing errors. If you do see pricing errors, have them corrected. The sample should not include more than one of the same item from the same display. If a sample item is out of stock, the next item is picked.*

Be sure to include at least 5-10 Price Look Up (PLU) and store-coded Items in the 200-item sample. Usually, these items do not have to be removed from the produce, bulk foods section, or deli display for use in this procedure. You can use the hand-held scanner or record the identity and item price designated at the product sales display of the items from the different department (produce, bakery, deli), if available, for price comparison through either the PLU programmed in the department scale or at the point-of-sale system. Have the PLU entered in the scale <sup>(See Note 1)</sup> or point-of-sale system (or have "store-coded" items scanned) and record the price and compare it with the sale displayed price. Record any errors <sup>(See Note 2)</sup>. When checking "store-coded" items from the meat or other departments, remember that a "U.P.C. symbol" on a random weight label is read by a scanner to obtain the total price and identity. The price is not stored in the point-of-sale database.

*Note 1: Some scales or point-of-sale systems do not display or record the unit price associated with the PLU unless a weight is on the scale. For these types of devices a one pound standard is placed on the scale load receiving element. Some systems automatically deduct tare so check to make sure that this does not affect the price indication.*

*Note 2: When errors are found during a PLU check, the manual entry must be verified to assure that the error was not caused by a keying mistake.*

#### **Detailed Illustration of the Randomized Sampling Procedure**

The following figures illustrate how the randomized sampling procedures could be implemented in a food store. The example is based on a sample size of 200 items in a store that has a total of 31 areas or ("aisles") from which samples are to be taken. The

procedure provides general instructions that allow the flexibility needed to adjust the sample to fit the store layout. To simplify the selection process, areas of the store and stand-alone displays can be grouped together as an "aisle" to be sampled.

The following breakdown of "aisles" is illustrated in figure 1.

Total "aisles" - 31

- 1 - All of the shelves and displays in the produce section are grouped as a single "aisle."
- 28 - The 13 aisles (26 rows of shelves), the counters along the back of the store and the deli/bakery and cash register area are counted as "aisles."
- 1 - The "end-of-aisle" displays at the front and back of the store are grouped as a single "aisle."
- 1 - The "stand-alone" displays and "promotion" counters in the center of the meat and dairy department aisles are grouped for sampling as a single "aisle."

Divide 200 by 31 to determine how many "samples" to take from each "aisle" or "group."

$200/31 = 6.45$  which is rounded up so that 7 items are taken from each "aisle."

#### Sample Selection from the Aisles

Figure 2 illustrates how the items are taken from an aisle with 6 shelves of products. The use of a specific "count," such as "selecting the 15th item," simplifies the sample selection process. The example shows the process starting on the top shelf left-hand corner, but the procedure can be further "randomized" by varying the starting point to other shelves, and to other points in the aisle, and to other counts (such as every 20th item). The "zigzag" pattern which results increases the randomness of the sample and helps ensure that the prices on a wide variety of merchandise groups are verified.

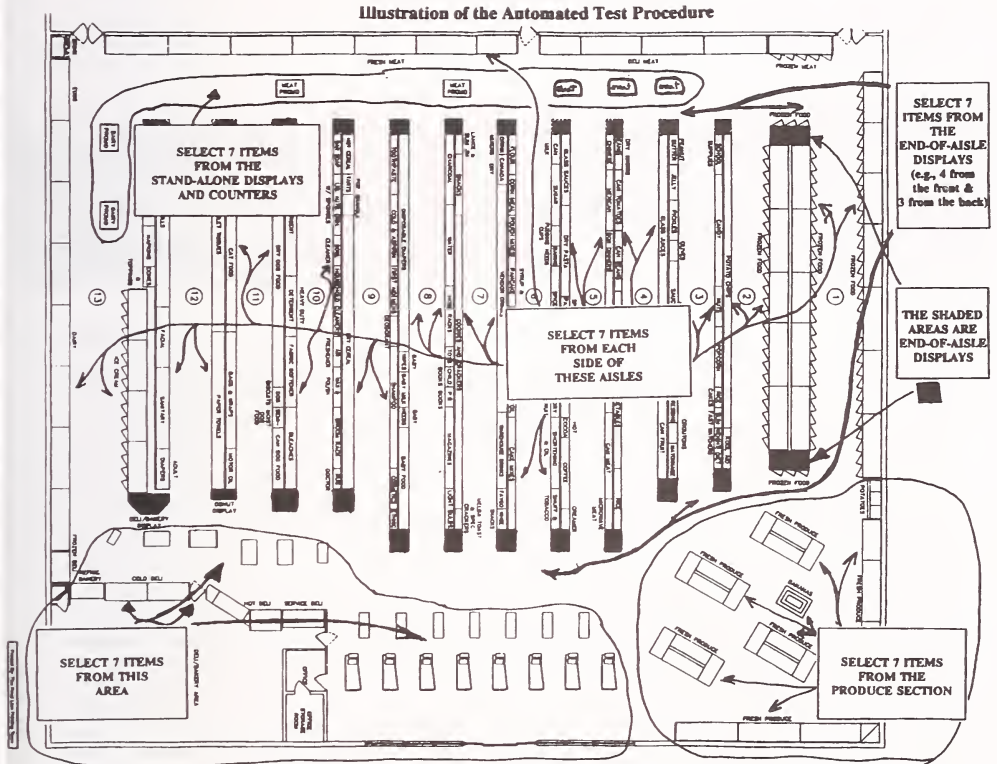
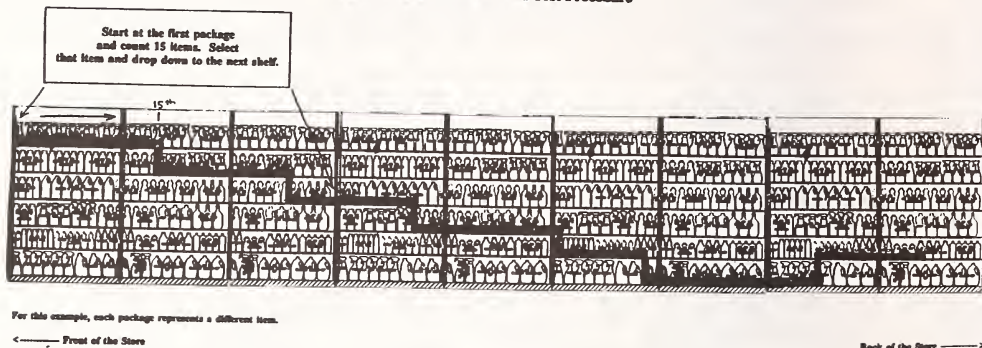


Figure 1. Illustration of the Randomized Sampling Procedure.

**Illustration of the Automated Test Procedure**



**Figure 2. Sample Selection from the Aisles.**

#### Evaluation of Results on 200-item sample:

See Section 9 for guidance on which errors are considered violations and refer to the accuracy and enforcement guidelines in Section 11.

#### Part II. Two-Stage (Manual) Test Procedure

**Inspection Procedure:** Select the packages and either (1) take them to a checkout terminal for scanning, (or use a hand-held scanner), or (2) record the product identity, U.P.C. number, and shelf price for each package on an inspection report and then manually enter the U.P.C. numbers in a register.

*Note: The following sampling procedures have been evaluated in field applications and provide good results. With only brief practice an inspection following either of the procedures can be completed in less than 1-1/2 hours.*

**Sample Size:** This test procedure is a two-stage sampling plan (50 initial items/100 total items) that begins with an initial sample of 50 items.

**Test Procedure:** Select at least 50 items using the prescribed sampling procedures. Record a brief identification of the item, its price and aisle location on a post-it note and affix it to the item, or record the same information on an inspection report (e.g., a brief item description, shelf or advertised price [unless an item price label is affixed], and aisle location). The aisle location makes it easy to locate the product if errors are found and in returning the items to the shelf after the inspection is complete. As the items are selected, use the "Price Verification Tally Sheet" to keep track of the number of items you have collected. (See Appendix A - Model Forms. The "Model Price Verification Report" included in this draft was prepared with the idea that you will only record information on the items found with price errors, not all of the items tested. This approach reduces paperwork and saves time.)

To continue the inspection, take the items to a register (or use a hand-held scanner), verify the prices by either scanning the items or entering a PLU code into the register and printing a tape receipt. The prices "charged" at the register are then compared to the advertised price of each item. An alternative test procedure for large or perishable items is to record the identity, U.P.C. Code, location, and price and manually enter them into the register to verify the price. However, this method is subject to recording and key entry errors.

## Accuracy Requirement

One error is permitted on a 50-item sample. If only one error is found and verified, the inspection is complete at this point. If more than one error is found and verified, 50 additional items are collected using the randomized sampling procedures and tested.

Two-stage sampling plans provide a time-effective means to quickly check the price accuracy of items offered for sale. While you are free to decide which aisle to start with, aisles which contain perishable items (e.g., frozen and dairy foods) should be sampled last if you take packages from coolers or freezers to a checkout counter so the products are not damaged by warming.

It is also acceptable to limit your sample collection to 25 items at a time to make it easier to keep track of the items, or sample from only 3 to 5 aisles in larger stores. This reduces the inspection lot size and inspection time. Much of the time savings is achieved by reducing the amount of your time devoted to walking around the store collecting and returning packages.

### First Stage Sample Selection -- 50 items

Based on comments received on the First Draft, the Manual Test Procedure section has been modified to permit the use of either a "randomized" or a combined "randomized/stratified" sampling plan. Either of the sampling plans is appropriate for initial or follow-up inspections. The combined plan, using the "randomized/stratified" approach may be preferred for use in initial inspections (e.g., the first time you inspect a store, in stores that have just implemented scanning, in stores that have had high error rates on particular groups of items in past inspections, or in responding to consumer complaints involving particular groups of items).

#### Follow either of these methods for the First Stage:

- **"Randomized Sampling Plan".** -- Obtain a "randomized" sample of 50 items. Use the "randomized" sampling procedures described above and select 50 items. This method will most likely result in a sample that includes sale, direct store delivery, regular priced and other items. It is the speedier of the two-stage test methods because you do not have to spend time looking for particular merchandise groups in different parts of the store; or
- **"Stratified Sampling Plan".** -- Select 50 items from the merchandise groups. This procedure is most effective if used during the initial inspection of a store. It allows you to focus attention on specific merchandise groups to determine if errors are occurring in any of the groups where errors are thought to occur more frequently (e.g., sale and direct delivery items). If there is an insufficient number of items in any merchandise group, or if the group of items is not available, increase the number of "randomized" items selected to obtain a total 50 items. As marketing practices evolve these groups may change as well. You can substitute "other" or new merchandise groups for any of the ones listed below (e.g., you may have identified errors in the "health and beauty aids" section or on "manager specials" during a previous inspection so samples from these groups could be substituted for any of the groups listed below.) You should select items from these merchandise groups as randomly as possible.

A "Price Verification Tally Sheet" in Appendix A is provided for you to use with the test procedures to keep track of the number of items selected.

**First Stage -- 50 items.** Use the "randomized" sampling procedures to select the following items. The "randomized" sampling plan described in Part I simplifies the sampling process and ensures that the samples are collected from a wide variety of locations in the store.

- **25 - "Regular Priced" items.** Select 1 or 2 items at random from different shelves on each aisle or display case or limit your sampling to shelves in 2-3 aisles, and
- **25 - Items.** Select a total of 25 items but include no more than 5 from any one of the following merchandise groups:



- "Direct-Store-Delivery (DSD)" items. If the store allows vendors to price DSD items, include those items in the sample.
- "End-of-Aisle" or "Tie-In-Display" items. This group can include both regular and sale price items.
- "Advertised Sale" items. Use the store's sales brochure, or newspaper advertisements to identify sale items. If you select "advertised" sale items, be sure to verify that the shelf or item price matches the price stated in the brochure or newspaper.
- "Special" items. This includes any item with a reduced price (e.g., items on "special" including "cents-off" or "percentage off" items, 2-for-the-price-of-1 specials, manager and in-store specials, or discontinued items.) Items typically discounted on a percentage basis included a manufacturer's product line, greeting cards, magazines or books.
- "PLU" items. This includes both regular and sale priced items offered in the produce, bakery, or bulk food departments and over scales at the direct sale counters. For direct service departments (e.g., produce, deli, specialty meats, etc.), select products at random (include some sale or special prices) and enter the code in the scale<sup>(See Note 1)</sup> to verify that the coded price matches the advertised price<sup>(See Note 2)</sup>.
- "Store-coded" items. This includes items offered in the produce, bakery, or meat departments that have labels with the U.P.C. symbol generated by scales and printers in the store. For store-coded items, scan the item and determine if the total price and identity on the label are accurately read by the point-of-sale system. When checking "store-coded" items from the meat or other departments, remember that a "U.P.C. symbol" on a random weight label is read by a scanner to obtain the total price and identity. The price is not stored in the point-of-sale database.
- "Other" items. This category is included to provide flexibility in the selecting a sample so that "seasonal" items, or products unique to the store or local market, can be included. Both regular and sale priced items can be included under this category.

*Note 1: Some scales or point-of-sale systems do not display or record the unit price associated with the PLU unless a weight is on the scale. For these devices a one pound standard is placed on the scale load receiving element. Some systems automatically deduct tare, so check to make sure that this does not affect the price indication.*

*Note 2: When errors are found during a PLU check, the manual entry must be verified to assure that the error was not caused by a keying mistake.*

After the items are scanned or codes entered (e.g., by you or a clerk at a register), a comparison is made between the advertised price and the displayed or receipt price. Any price differences must be double checked to confirm that a violation exists. Instead of checking the items against the displayed indications, it is faster to scan or key in the codes on all items and then compare the prices with the register tape.

#### **Evaluation of Results on 50 items:**

See Section 9 for guidance on which errors are considered violations:

- One violation is permitted on a 50-item sample. If only one violation is found and verified, the inspection is complete.

#### **Second Stage**

- If more than one violation is found and verified, collect 50 more items using the randomized sampling procedures and tested for a total sample size of 100 items. If errors were found in any specific merchandise group (or groups) of items (e.g., direct-store-delivery items, PLU Codes, or specials), the additional 50 items should include additional samples of those merchandise groups. Do not include more than 5 items of that group or groups.

### Evaluation of Results on 100-item sample

See Section 9 for guidance on which errors are violations and refer to the enforcement guidelines in Section 11.

- 98 percent accuracy is required on the 100-item sample (two violations are permitted on a 100-item sample). If more than two violations are found and verified, the store does not meet the accuracy guidelines in Section 11.

### Part III. Test Procedure for Conducting Test Purchases, Investigation of Consumer Complaints, and for Verifying Manually Entered Prices

This procedure may be used to (1) investigate consumer complaints, (2) determine if a store has corrected a pricing error after being notified by a consumer or inspector that an error occurred, or (3) determine if clerks who enter prices manually are making correct key entries.

*Note: When verifying keyed price entries, store management is not typically notified of the test until the items have been totaled and the transaction completed.*

- Precautions should be taken to ensure that the clerk is not aware that the test purchase procedure is being conducted. Do not raise questions concerning any errors that you observe and do not offer any information if asked the price of an item in cases where the item price is illegible or the item is not on file.
- Use the "randomized" sampling procedures to select a sample of 10-50 items that includes regular and sale priced items, PLU or SKU items, and advertised specials from various departments in the store. It is acceptable to purchase only one or just a few items if you are responding to a complaint concerning a specific item. Typically, it is best to pick two items from each aisle and include several groups of items. Record the name and identity of the product, as well as the labeled or advertised price, for each item.
- Proceed through a check-out as if you were a regular customer and pay for the purchases. Obtain the original sales receipt, move to an out-of-the-way location and compare the price charged with the labeled or advertised price for each item. Record the time of day, lane number, and identify the cashier. Before leaving the store, determine if any errors have occurred. Identify yourself to the store management and inform the representative that a test purchase has been conducted and report the results. (In most cases the store will credit back all of the items and refund the test purchase money.) Record the information on the test report form and determine the cause of the error (e.g., was it operator error, mislabeling of the item, or incorrect price sign?). Return all items to the place where you collected them. Perishable goods should be returned as quickly as possible.

### Alternative Procedure - Consumer Complaints

Consumer complaints can also be investigated by using any of the test procedures described above or by only verifying the price of the item or items listed in the complaint. If the complaint is valid, you can limit your inspection to just the items described in the complaint or conduct one of the full test procedures.

### Evaluation of Results:

The errors for items tested using this test method should be evaluated according to sections 9 and 11.

## 8. Documentation of Findings

A Model Price Verification Report is contained in Appendix A. The form was developed so that you only have to record the items found with price errors.

- Record all errors and provide information on the cause if determined. Indicate if the errors are considered violations, if stop-sale orders were issued, or if the violation was corrected.
- Important comments should always be noted on the test form (e.g., warnings, violations ordered corrected).

- Document signage violations and take appropriate enforcement action.
- Cash register receipts of all items must be kept and attached to the inspection report as evidence.
- Printed advertisements and sales flyers must be kept and attached to the inspection report when errors are found in these categories.

## 9. Evaluation of Results

Every error must be verified and, if possible, its cause determined so that you can judge whether the store is following good pricing practices. If good pricing practices are in place, the store will maintain "price integrity." The prices advertised in the store will not be reliable if pricing procedures appropriate for the operational practices of the store are not followed.

An error found to result from any of the following causes **shall not** be considered a violation for enforcement purposes:

- Any intentional undercharge that is found within 24 hours of the time that the price was reduced in the store's database if documentation or other confirmation of the date and time of the price change is provided to you at the time of the inspection.
- Any error caused by a nonstandard U.P.C. symbol if the store takes immediate action to eliminate the symbol problem by defacing the symbol and pricing or relabeling the merchandise so that the correct price is charged. The store must notify the manufacturer of the U.P.C. of the error and advise the inspection agency in writing of the action the manufacturer has taken to correct the symbol. This type of error is rarely encountered, but it has been known to occur. Typically the product will not scan at all or the scanner reads the code and provides price information for another product.
- Any error caused by a mistake made in a newspaper or printed brochure by a printing firm, or other media in an advertisement, if the store places a sign adjacent to the item indicating that a mistake occurred in the advertisement.
- Any error obviously caused by a price label that is missing or that has fallen off the shelf or item or has obviously been relocated by an unauthorized person.

Not-on-File Item. - Items scanned or keyed at a cash register and not found in the database. Items reported not-on-file are not errors.

It is recommended that you work with the store's pricing coordinator or representative to identify the cause of any error and make note of the problem/cause on the inspection report. This does not change the finding of the report but will help to identify problems relating to staff errors, failure to follow through on established store pricing procedures, data entry errors, or failure of management to provide correct written data, etc. Overcharge and undercharge errors found are considered in enforcement actions. The supporting information detailing the problem/cause will help with enforcement decisions as well as in-house monitoring of the pricing of products.

## 10. Post-Inspection Tasks

A meeting should be held with the store manager or authorized representative.

- If you removed items from display, ensure that items are returned to their proper location on the store shelves.
- Have the inspection report completed prior to the conference and be prepared to briefly summarize your findings and recommended actions.
- Explain any violations noted on the report and explain the nature of each error if any were found.

- Explain any notice of noncompliance issued and be sure the individual acknowledges that they understand what corrective action is expected if any.
- If necessary, describe the implications of the accuracy level found during the inspection and advise the firm of the action that you intend to take. If an increased inspection frequency is called for due to the accuracy level found during the inspection, advise the firm that reinspections will be made, but do not indicate when they may occur.
- Provide a copy of your report to the representative.
- Return borrowed safety and health items or test equipment, if any was used to conduct the inspection.

## 11. Accuracy Requirements and Enforcement

- Errors should be corrected or (if the correction cannot be made immediately) stop sale orders issued before you leave the business.

*Note: If the errors are not corrected in your presence, a follow-up inspection can be made later in the day or the following day to determine if the store corrected the error. If a store fails to correct the error at that point, higher level enforcement action should be taken.*

- Enforcement action may be initiated at any time in the inspection process based on the facts of the individual case (e.g., consumer complaints are found to be valid, gross monetary overcharges of 50 percent or more of the advertised price of an item, an accuracy rate of 95 percent or less on any inspection conducted in accordance with this Examination Procedure, or the overcharge to undercharge ratio exceeds 3/1).

### Enforcement

- Lower levels of enforcement include increased inspection frequency, stop-sale or correction orders, or the holding of administrative hearings conducted by the agency making the inspection.
- Higher levels of enforcement include warning letters, the imposition of civil or administrative penalties, referral of the case to the district attorney or attorney general for prosecution, or the issuance of a citation.
- Compliance is based on the accuracy found on a price verification examination conducted according to one of the procedures specified above.

**Accuracy:** Laws require 100 percent accuracy in pricing. It is not the intent of the Working Group to set a "tolerance" on price accuracy. Nothing in this procedure should be construed or interpreted to prohibit any jurisdiction from enforcing its laws. The "accuracy" guidelines contained in this procedure are based on the same logic that governs other weights and measures enforcement efforts. The "theory of tolerances" explained in the Fundamental Considerations of NIST Handbook 44 provides a solid foundation for the approach taken in this procedure. The theory or principle, paraphrased for use in price verification, would say that "price errors are minimized so that the permitted number of errors are sufficiently small that there is no serious injury to either the buyer or seller, yet not so small as to make compliance or enforcement costs disproportionately high."

Comments received on the first draft suggested accuracy requirements from 95 to 100 percent. The recommendations for 95 and 100 percent accuracy were not accepted because available information indicates that neither meets the "principle" mentioned above. Information is available to show that retail food stores can meet a 98+ percent accuracy requirement using current technology and "pricing practices" commonly used in many food stores. This requirement also recognizes that enforcement agencies have limited resources to conduct price verification inspections. Indeed, it is difficult to envision any jurisdiction devoting the amount of time it would require to achieve or maintain a 99 or 100 percent level of compliance in thousands of retail stores. Also, several jurisdictions indicated that they thought it would be very difficult to convince prosecutors to accept the volume of cases that would be generated, or a court system to undertake the caseload, that would result if a "zero tolerance" approach to price verification is adopted.



It is apparent from information collected from jurisdictions and industry across the country that some stores with "best pricing practices" achieve levels of 99+ percent accuracy in the correct price. Unfortunately, these are exceptions and not the rule at this time. At the second meeting new information was provided by a retail inventory firm that conducts "wall-to-wall" price verification inspections of food stores (100 percent of the items in the store are tested in 5-6 hours using a crew of 6-8 people using hand-held scanning devices). The firm has conducted over 3,000 inspections involving more than 50 million items. The results reported at the meeting indicated that only 1 of the 3,000 stores inspected had an accuracy of 99 percent (this store reported that they devoted 200+ hours of labor to price accuracy per week). Typically, other food store inaccuracies ranged from 8-12 percent on tests of 100 percent of the items though some with no price auditing programs had errors up to 25 percent.

A compliance guideline that provides for some level of error (for example, not recommending enforcement action if the inspection revealed 98 percent accuracy) would not be a legal definition of compliance with the law. Rather, it is a practical administrative guide to allow jurisdictions to focus attention on serious violations (e.g., the thousands of stores that might have accuracies of 92 to 75 percent. This approach is realistic because it recognizes that 100 percent accuracy, though possible, may not be obtained at a reasonable cost to the store or government agency enforcing the law.

**Inform-Warn-Action.** -- Historically, weights and measures officials have effectively achieved voluntary compliance with laws relating to accurate net contents through the "inform, warn, and action" process. This approach cannot be codified because law enforcement agencies must have wide flexibility to effectively regulate the marketplace.

Experience shows that the inform-warn-action approach is also appropriate for use in price verification inspections. The process begins with an initial inspection and includes an educational function to ensure that stores understand the legal requirements and their responsibilities. The consequences of noncompliance are explained in addition to the procedures that will be used to measure compliance. When violations are found, the second step is to conduct a follow-up inspection to determine if compliance has been obtained voluntarily. If compliance is not obtained, further educational steps are taken or warnings are issued to repeat violators to make them aware that legal action could be taken if noncompliance continues. The second step allows the official an opportunity to evaluate the action taken by the firm to correct violations, and provides the official the chance to resolve violations caused by ignorance of the law or poor communication. The third step, a higher level of enforcement action, is taken if reinspection reveals a failure by the store to take steps that eliminate the violations.

#### **Accuracy Guidelines**

Compliance determinations based on a percentage of errors found in the items tested, the ratio of overcharges to undercharges, and the difference in inaccuracy rates found between "regular" and "sale" priced items are the most useful criteria for consumers, business, and weights and measures officials to use in evaluating the "pricing integrity" of any store. Overcharges and undercharges must be considered errors in taking lower level enforcement actions since (1) either type of error misrepresents the price of the item. (2) The occurrence of any error in a randomized sample may indicate poor pricing practices that would result in errors on other items sampled from the inspection lot. (3) The ratio of overcharges to undercharges (e.g., on a sample of at least 200 items or the combined results from several inspections) may indicate systematic problems with the store's pricing practices.

- Any level of enforcement action may be appropriate for overcharges (e.g., civil penalties may be imposed for overcharges).
- Enforcement action for monetary errors on individual items, errors on items tested in response to complaints, or errors found on follow-up inspection of items ordered corrected, should be taken independently from any sample, giving consideration to the magnitude of the violation, corrective action by the establishment, and any other relevant information.

#### **Computing Sample Errors**

The following formulas are used to determine sample error and the overcharge to undercharge ratio:

1. Adjust the total sample by subtracting any items or errors specified in Section 9.



**Sample Error**

2. Divide the number of errors by the sample size to obtain the error in percent.

For example: a sample of 200 items is tested; 1 not-on-file item and 3 overcharges and 1 undercharge are found.

200 items - 1 not-on-file item = 199 items

Total errors = 4

4 errors ÷ 199 items = 2 percent sample error.

**Ratio of Overcharges to Undercharges (used on large sample sizes and in follow-up activities)**

3. Total the overcharges/undercharges

3 overcharges/1 undercharge = 3 to 1 ratio

**Accuracy**

For a store to "pass" a single inspection,

- the accuracy of the sample must be 98 percent or higher; and
- on larger sample sizes (e.g., 1000 packages) the number of overcharges and undercharges must not exceed a 1/1 ratio when at least 10 under- and overcharge errors are found in a large sample size (see Section 12. Follow-up Activities for guidance in applying this requirement to single inspections and in follow-up activities); or
- when manual test procedures are used, only one violation is found in the initial sample of 50 items.

**Enforcement levels:**

1. **Level One** - If price accuracy is 98 percent or higher on a sample of 50 or more items (and the overcharge to undercharge ratio on large sample sizes does not exceed 1/1) and the store is on a normal inspection frequency:

- A notice of noncompliance is issued on any violations, and the store is kept on its normal inspection frequency.
- If the store is on increased inspection frequency, the store remains on this frequency until its inspection results conform to Terms of Increased Inspection Frequency.

2. **Level Two** - If price accuracy is less than 98 percent on a sample of at least 50 items (and the overcharge to undercharge ratio on large sample sizes does not exceed 1/1) and the store is on normal inspection frequency:

- A notice of noncompliance is issued, and the store is placed on an increased inspection frequency.
- A second inspection should be conducted within 25 business days. If the price accuracy does not meet Level One, a warning notice is issued.
- A third inspection should be conducted within 45 business days. If the price accuracy does not meet Level One, formal enforcement action is taken if the overcharges exceed 2 percent of the sample.

If the store is on increased inspection frequency, a warning notice should be issued and the store reinspected within 25 business days. If the price accuracy does not meet Level One, higher levels of enforcement action should be taken if overcharges exceed 2 percent.

Examples for the 100-item sample size:

- a. If 100 items are tested and 3 overcharges are found in the sample, the error rate is 3 percent. In this example higher levels of enforcement action would be taken.
- b. If 100 items are tested and 3 overcharges and 2 undercharges are found, the error rate on the sample is 5 percent, but overcharges are 3 percent. In this example higher levels of enforcement action would be taken.
- c. If 100 items are tested and 2 overcharges and 3 undercharges are found, the error rate is still 5 percent, but overcharges are 2 percent of the sample. In this example higher levels of enforcement action would not be taken.

**Terms of Increased Inspection Frequency** - When a store has been placed on an increased inspection frequency, it shall remain at that frequency until such time as there are two consecutive inspections with errors at Level One (e.g., 98 percent or higher accuracy.)

#### **Higher Levels of Enforcement Action**

Overcharges and undercharges are used to determine lower levels of enforcement actions, but higher levels of enforcement action (e.g., fines or penalties) are taken **only** on the overcharges found in the sample (e.g., when the overcharges exceed 2 percent on the sample). A store's history of total error rates, the difference in inaccuracy rates found between "regular" and "sale" priced items, and the ratio of overcharges to undercharges are used as evidence of poor pricing practices to support formal action.

Examples:

- a. If 200 items are tested and 5 overcharges are found in the sample, the error rate is 2.5 percent. In this example higher levels of enforcement action would be taken.
- b. If 200 items are tested and 5 overcharges and 3 undercharges are found, the error rate on the sample is 4 percent, but overcharges are 2.5 percent. In this example higher levels of enforcement action would be taken.
- c. If 200 items are tested and 2 overcharges and 6 undercharges are found, the error rate is still 4 percent, but overcharges are 1 percent of the sample. In this example higher levels of enforcement action would not be taken.

**Table of Price Errors** - This table shows the percentage of errors in different sample sizes:

	Price Errors and Percentage							
	Sample Size							
	10	30	50	100	150	200	250	300
1	10%	3%	2%	1%	0.67%	0.50%	0.40%	0.33%
2	20%	6%	4%	2%	1.33%	1.00%	0.80%	0.67%
3	30%	10%	6%	3%	2.00%	1.50%	1.20%	1.00%
4	40%	13%	8%	4%	2.67%	2.00%	1.60%	1.33%
5	50%	16%	10%	5%	3.33%	2.50%	2.00%	1.67%
6	60%	20%	12%	6%	4.00%	3.00%	2.40%	2.00%
7	70%	23%	14%	7%	4.67%	3.50%	2.80%	2.33%
8	80%	26%	16%	8%	5.33%	4.00%	3.20%	2.67%
9	90%	30%	18%	9%	6.00%	4.50%	3.60%	3.00%
10	100%	33%	20%	10%	6.67%	5.00%	4.00%	3.33%
11		36%	22%	11%	7.33%	5.50%	4.40%	3.67%
12		40%	24%	12%	8.00%	6.00%	4.80%	4.00%
13		43%	26%	13%	8.67%	6.50%	5.20%	4.33%
14		46%	28%	14%	9.33%	7.00%	5.60%	4.67%
15		50%	30%	15%	10.00%	7.50%	6.00%	5.00%

## 12. Follow-up Activities

Effective price verification programs require top management support and involvement so that early definition of the program's objectives and desired benefits can be identified and incorporated into the enforcement agency's work plans and budget. Measurement of pre- and post-implementation performance must be used to calculate whether the scope and implementation of the program is adequate and whether payback has been achieved. Price verification inspections that reveal errors must be the subject of follow-up action to ensure that the management of the store fulfills its obligations to ensure accurate prices. Failure to follow up on documented violations wastes the investment of valuable inspection resources and does not provide the public with good service or protection.

To ensure adequate control and follow-up, a database should be established in each jurisdiction that provides information on every store including:

- Date of inspections
- Accuracy level and sample size used in the inspection
- Error rates for "regular" and "sale or specially priced" items (if maintained)
- Ratio of overcharges to undercharges. - As the history of store compliance develops, the number of overcharges and undercharges can be evaluated to determine if systematic errors or other problems exist. A 1/1 ratio should be maintained when at least 10 errors are found over several inspections or in a single large sample size (e.g., the results of several 100- or 200-item inspections collected over a period of time or 1000 packages in a single lot).

The ratio of 1 overcharge to 1 undercharge criterion is an indicator of the store's pricing practices. A store with good pricing control may be expected to make random errors in pricing. The ratio will rarely be exactly 1/1 (e.g., in 10 errors, 5 overcharges and 5 undercharges), but would likely vary slightly either way over several inspections. The randomized sampling procedures and larger sample sizes contained in this outline will allow weights and measures officials to evaluate the results of the inspections with more confidence. If a store has a high ratio of overcharges to undercharges (e.g., 2/1, 3/1), it will serve as a strong indicator that the store is not following good pricing practices, but enough errors must be present in order to make this determination. (Consider the example of 12 pricing errors consisting of 8 overcharges and 4 undercharges: the ratio of overcharges to undercharges is 2 to 1. Similarly, 10 pricing errors consisting of 6 overcharges and 4 undercharges corresponds to a ratio of 1.5 to 1; since all decimal values are truncated to whole numbers, 1.5 is truncated to 1, and the ratio becomes 1 to 1.)

The 1/1 ratio criteria should be applied to any sample size if at least 10 errors are present. For example, if 1000 packages are tested and 10 packages are found in error, the sample has an accuracy of 99 percent. However, if 9 of the 10 errors are overcharges (i.e., a ratio of 9/1), the store should be considered to have poor pricing practices or other problems; if 100 packages are tested and a 90 percent accuracy is found, 10 items in error not meeting the 1/1 ratio can be used as evidence of poor pricing practices in compliance action.

### 13. Appendices

- Appendix A - Model Forms

1. Sample Tally Sheet: this form is used to keep track of the number of samples tested.
2. Model Inspection Form: this form is used to document violations and record findings. A completed sample is provided.

# Appendix A. Model Forms - Price Verification Tally Sheet

Item Error

	Aisle Location	Identity	Shelf Price
"End of Aisle" or "Tie In Display"	1. _____	1. _____	1. _____
	2. _____	2. _____	2. _____
	3. _____	3. _____	3. _____
	4. _____	4. _____	4. _____
	5. _____	5. _____	5. _____
"PLU or Coded" Items	6. _____	6. _____	6. _____
	7. _____	7. _____	7. _____
	8. _____	8. _____	8. _____
	9. _____	9. _____	9. _____
	10. _____	10. _____	10. _____
"Advertised Sale" Items	11. _____	11. _____	11. _____
	12. _____	12. _____	12. _____
	13. _____	13. _____	13. _____
	14. _____	14. _____	14. _____
	15. _____	15. _____	15. _____
	16. _____	16. _____	16. _____
	17. _____	17. _____	17. _____
	18. _____	18. _____	18. _____
	19. _____	19. _____	19. _____
	20. _____	20. _____	20. _____
Items on "Special"	21. _____	21. _____	21. _____
	22. _____	22. _____	22. _____
	23. _____	23. _____	23. _____
	24. _____	24. _____	24. _____
	25. _____	25. _____	25. _____
"Direct Store Delivery" Items	26. _____	26. _____	26. _____
	27. _____	27. _____	27. _____
	28. _____	28. _____	28. _____
	29. _____	29. _____	29. _____
	30. _____	30. _____	30. _____
"Randomly Selected" Items	31. _____	31. _____	31. _____
	32. _____	32. _____	32. _____
	33. _____	33. _____	33. _____
	34. _____	34. _____	34. _____
	35. _____	35. _____	35. _____
	36. _____	36. _____	36. _____
	37. _____	37. _____	37. _____
	38. _____	38. _____	38. _____
	39. _____	39. _____	39. _____
	40. _____	40. _____	40. _____
	41. _____	41. _____	41. _____
	42. _____	42. _____	42. _____
	43. _____	43. _____	43. _____
	44. _____	44. _____	44. _____
	45. _____	45. _____	45. _____
	46. _____	46. _____	46. _____
	47. _____	47. _____	47. _____
	48. _____	48. _____	48. _____
	49. _____	49. _____	49. _____
	50. _____	50. _____	50. _____



# Appendix A Model Forms - Price Verification Report

Page \_\_\_\_ of \_\_\_\_

Inspection: ☐ 1st ☐ 2nd ☐ 3rd Complaint: ☐ Frequency: ☐ Normal ☐ Increased Type: ☐ Stratified ☐ Automated ☐ Randomized

Location of Test (Store Name, Address, County, Zip Code)	Date:	Telephone:
	Manager:	Inspection Lot Size:

Identity, Brand Name	Number of Items, Size, Location in Store, or U.P.C. Code	Offered Price	Price Charged	Price Error in Cents
1.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
2.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
3.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
4.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
5.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
6.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
7.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				
8.				
<input type="checkbox"/> Stop Sale Issued <input type="checkbox"/> Corrected Comments:				

Comments/Remarks:

Evaluation of Results:

Report Acknowledgement

Name/Title \_\_\_\_\_

Undercharges

Inspector \_\_\_\_\_ Time In: \_\_\_\_\_ Time Out: \_\_\_\_\_

\_\_\_\_ Sample - \_\_\_\_ Not on File = \_\_\_\_ Adjusted Sample

\_\_\_\_ Errors + \_\_\_\_ Adjusted Sample = \_\_\_\_ Error

Accuracy \_\_\_\_ % Ratio: \_\_\_\_ Overcharges

# Appendix A Model Forms - Price Verification Report

Page \_\_\_\_ of \_\_\_\_

Section: ☐ 1st ☐ 2nd ☐ 3rd Complaint: ☐ Frequency: ☐ Normal ☐ Increased Type: ☐ Stratified ☐ Automated ☐ Randomized

Location of Test (Store Name, Address, County, Zip Code)	Date:	Telephone:
	Manager:	Inspection Lot Size:

Identity, Brand Name	Number of Items, Size, Location in Store, or U.P.C. Code	Offered Price	Price Charged	Price Error in Cents ±
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			
Stop Sale Issued <input type="checkbox"/> Corrected	Comments:			

Comments/Remarks:

Evaluation of Results:

\_\_\_\_ Sample - \_\_\_\_ Not on File = \_\_\_\_ Adjusted Sample

\_\_\_\_ Errors + \_\_\_\_ Adjusted Sample = \_\_\_\_ Error in %

Accuracy \_\_\_\_ % Ratio: \_\_\_\_ Overcharges \_\_\_\_

Report Acknowledgement

Name/Title \_\_\_\_\_

Undercharges

Inspector \_\_\_\_\_ Time In: \_\_\_\_\_ Time Out: \_\_\_\_\_

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## Appendix G

### 2.6.8. Commodities Under Federal Trade Commission Jurisdiction Under the Fair Packaging and Labeling Act and Exclusions.

#### 2.6.8. Commodities Under Federal Trade Commission Jurisdiction under the Fair Packaging and Labeling Act and Exclusions.

This list indicates the commodities and commodity groups that are not within the scope of the Fair Packaging and Labeling Act administered by the Federal Trade Commission (FTC). The following codes appear with each commodity and designate the reason that the particular commodity has been excluded.

**BATF** - designates commodities subject to laws administered by the Bureau of Alcohol, Tobacco, and Firearms.

**CI (Commission Interpretation)** - designates those categories that have been excluded by the Commission in the light of legislative history of the definition of "consumer commodity." By applying this definition to individual commodities, the Commission has more narrowly applied the latter term and set forth a list of items that do not meet the criteria of consumer commodities. On occasion the Commission is requested in both a formal and informal manner to consider individual products and to determine their status relative to the definition of "consumer commodity" as it is used in the Act.

**EPA** - designates commodities subject to the Federal Environmental Pest Control Act of 1972 administered by the Environmental Protection Agency.

**FDA** - designates those commodities which are subject to regulation by the Food and Drug Administration either under the portion of the FPLA administered by that agency or the Federal Food, Drug, and Cosmetic Act. (Section 10(a) (3) and Section 7 of the FPLA). Following the code FDA will be a letter further designating the commodity as either a food (F), drug (D), cosmetic (C), or device (DV).

**USDA** - designates those commodities excluded from jurisdiction by Section 10(a) of the FPLA and represents a commodity within one of the

following categories: meat or meat products, poultry or poultry products, or tobacco or tobacco products.

It may be of some help in ascertaining whether a particular product is or is not included within the FPLA definition of "consumer commodity" and thus subject to FTC jurisdiction under that Act, to refer to the following definition:

*"... Any article, product, or commodity of any kind or class which is customarily produced or distributed for sale through retail sales agencies or instrumentalities for consumption by individuals, or use by individuals for purposes of personal care or in the performance of services ordinarily rendered within the household, and which is usually consumed or expended in the course of such use."*

By applying these criteria to the particular product in question and then reviewing the list of excluded commodities, the observer will be able, in most instances, to determine the status of the item. In the event, however, that the observer is unable to ascertain whether a particular commodity is covered or excluded from FTC jurisdiction, contact FTC for an opinion.

#### Commodities Included Under FTC Jurisdiction

##### 1. Soaps and Detergents

- a. Powder, flakes, chips, etc.
- b. Liquid
- c. Paste, cake, or tablet

##### 2. Cleaning Compounds

- a. Liquid
- b. Powder
- c. Paste or cake

##### 3. Laundry Supplies

- a. Conditioners and softeners, ironing aids, distilled water.
- b. Sizings and starches
- c. Bluings and bleaches
- d. Pre-soaks, enzymes, etc.



#### 4. Cleaning Devices

- a. Sponges
- b. Steel wool, scouring, and soap pads
- c. Chamois

#### 5. Food Wraps

- a. Plastic and cellophane
- b. Wax paper and paper
- c. Foil

#### 6. Paper Products

- a. Toweling
- b. Napkins, table cloths, and place mats
- c. Facial tissues
- d. Bathroom tissues
- e. Disposable diapers
- f. Crepe paper
- g. Other, e.g., shelf paper, wrapping paper, eye glass tissues, etc.

#### 7. Waxes and Polishes

- a. Powder
- b. Liquid
- c. Paste and cake
- d. Other, e.g., polish impregnated cloths, scratch removers, etc.

#### 8. Household Supplies

- a. Matches
- b. Candles and holders
- c. Toothpicks
- d. Cordage (string, twine, rope, clothes line, etc.)
- e. Drinking straws
- f. Lighter and propane torch fuel, flints, pipe cleaners, etc.
- g. Household lubricants
- h. Picnic supplies
- i. Sand paper and emory paper
- j. Charcoal briquets, chips, logs, etc.
- k. Dyes and tints
- l. Camera film and photo supplies
- m. Protective fabric sprays

#### 9. Containers

- a. Paper (plain, waxed, or plastic coated)
- b. Foil
- c. Plastic or styrofoam

#### 10. Air Fresheners and Deodorizers

- a. Potpourri

#### Commodities Excluded from FTC Jurisdiction

ADHESIVE TAPE (FDA-D)  
ALCOHOLIC BEVERAGES (BATF)  
ALUMINUM CLOTHESLINE (plastic clothesline with a steel core) (CI)  
ANTIFREEZE (CI)  
ARTIFICIAL FLOWERS AND PARTS (CI)  
AUTOMOTIVE ACCESSORIES (floor mats, seat covers, spare parts, etc.) (CI)  
AUTOMOTIVE CHEMICAL PRODUCTS (auto polish, wax, and finish conditioner, rubbing compound, tire paint, chrome polish, gasoline additives, etc.) (CI)

BATH OIL AND BUBBLE BATH (FDA-C)  
BICYCLE TIRES AND TUBES (CI)  
BOOKS (CI)  
BOTTLED GAS (cooking or heating) (CI)  
BRUSHES (bristle, nylon, etc., including hair-brushes, toothbrushes, hand and nail brushes, paint brushes, etc.) (CI)  
BROOMS AND MOPS (glass, floor, and dish mops, etc.) (CI)  
"BUG PROOF" SHELF PAPER (EPA)

CANDLE HOLDERS (without candles) (CI)  
CAMERAS (CI)  
CHINAWARE (CI)  
CHRISTMAS LIGHT SETS (replacement or other bulbs sold separately are not excluded) (CI)  
CIGARETTE LIGHTERS (CI)  
CLOTHESPINS (CI)  
CLOTHING AND WEARING APPAREL (socks, gloves, shoelaces, underwear, etc.) (CI)  
COMPACTS AND MIRRORS (CI)  
COSMETICS (Defined by Section 201(i) of the Food, Drug, and Cosmetic Act as "(1) articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance, and (2) articles intended for use as a component of any such articles; except that such term shall not include soap.") (FDA-C)  
COTTON PUFFS (Sterilized) (FDA-D)  
CRYSTALWARE (CI)

DETERGENT BAR WITH ANY DRUG OR COSMETIC CLAIM (If the observer experiences

difficulty in ascertaining whether or not a given product is a soap or a detergent, contact the manufacturer or FDA.) (FDA-D or C)

**DECORATIVE MAGNETS (CI)**

**DEVICES** (Defined by Section 201(h) of the Food, Drug, and Cosmetic Act as "instruments, apparatus, and contrivances, including their components, parts, and accessories, intended (1) for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other animals; or (2) to affect the structure or any function of the body of man or other animals.")

This category includes trusses, syringes, arch supports, etc.) (FDA-DV)

**DIARIES AND CALENDARS (CI)**

**DISINFECTANTS (EPA)**

**DRUGS** (Defined by Section 201(g) (1) of the Food, Drug, and Cosmetic Act as "(a) articles recognized in the official United States Pharmacopeia, official Homeopathic Pharmacopeia, or official National Formulary, or any supplement to any of them; and (b) articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other animals; and (c) articles (other than food) intended to affect the structure or any function of the body of man or other animals; and (d) articles intended for use as a component of any articles specified in clause (a), (b) or (c); but does not include devices or their components, parts, or accessories.") (FDA-D)

**DURABLE ARTICLES OR COMMODITIES (CI)**

**EPA COVERED PRODUCTS** (Products subject to regulation under the Federal Environmental Pesticide Control Act that is administered by the Environmental Protection Agency.) (EPA)

**FINGERNAIL FILES (CI)**

**FLOWERS, FLOWER SEEDS, FERTILIZER, AND FERTILIZER MATERIALS, PLANTS OR SHRUBS, GARDEN AND LAWN SUPPLIES (CI)**

**FOOD** (Defined by Section 201(f) of the Food, Drug, and Cosmetic Act as "(1) articles used for food and drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article.") (FDA-F)

**FOUNTAIN PENS, MECHANICAL PENCILS, AND KINDRED PRODUCTS** (ball point pens, lead pencils, and lead refills, etc.) (CI)

**GARDEN TOOLS** (hose, trowels, grass clippers, etc.) (CI)

**GERMKILLING OR GERMPROOFING PRODUCTS (EPA)**

**GIFT TAPE AND TIES** (ribbon, tape, etc.) (CI)

**GIFT WRAPPING MATERIAL** (decorative wrapping foil, paper, cellophane, etc.) (CI)

**GLASSES AND GLASSWARE** (disposable plastic glasses are not excluded) (CI)

**GLOVES** (of any type) (CI)

**GREETING CARDS (CI)**

**HAIR COMBS, NETS, and PINS (FDA-DV)**

**HAND TOOLS (CI)**

**HANDICRAFT AND SEWING THREAD** (yarn, etc.) (CI)

**HARDWARE** (extension cords, thumb-tacks, hose clamps, nails, screws, picture hangers, etc.) (CI)

**HOUSEHOLD APPLIANCES, EQUIPMENT, OR FURNISHINGS, INCLUDING FEATHER AND DOWN-FILLED PRODUCTS, SYNTHETIC-FILLED BED PILLOWS, MATTRESS PADS AND PATCHWORK QUILTS, COMFORTERS, AND DECORATIVE CURTAINS (CI)**

**INK (CI)**

**INSECTICIDES** (insect repellents in any form, mothballs, etc.) (EPA)

**IRONING BOARD COVERS (CI)**

**JEWELRY (CI)**

**LAMBS WOOL DUSTERS (CI)**

**LUGGAGE (CI)**

**MAGNETIC RECORDING TAPE** (reels, cassettes, and cartridges.) (CI)

**MEAT AND MEAT PRODUCTS (USDA)**

**METAL PAILS (CI)**

**MOTOR OIL** (including additives. Household multi-purpose oil is not excluded.) (CI)

**MOUSE AND RAT TRAPS (CI)**

**MOUTHWASH (FDA-D)**

**MUSICAL INSTRUMENTS (CI)**

**PAINTS AND KINDRED PRODUCTS** (wallpaper, turpentine, putty, paint removers, caulking and glazing compounds, wood fillers, etc. Note, however, that bathroom caulking materials, patching plaster, spackling compound, and plastic wood are not excluded. In the event of uncertainty, contact FTC.) (CI)

**PAINTINGS AND WALL PLAQUES (CI)**

**PET CARE SUPPLIES (CI)**

**PEWTERWARE (CI)**

**PHOTO ALBUMS (CI)**

**PICTURES (CI)**

**PLASTIC BUCKETS AND GARBAGE CANS (CI)**

PLASTIC TABLECLOTHS, PLASTIC PLACE MATS (CI)

PLASTIC SHELF LINING (CI)

PRE-MOISTENED TOWELETTES (FDA-C)

POLISHING CLOTHS (polishing cloths that are impregnated with polish or chemicals [silicone, etc.] are not excluded.) (CI)

POULTRY AND POULTRY PRODUCTS (USDA)

RUBBER GLOVES (CI)

RUBBING ALCOHOL (FDA-D)

SAFETY FLARES (CI)

SAFETY PINS (CI)

SANITARY NAPKINS (FDA-D or C)

SCHOOL SUPPLIES (rulers, crayons, paper, pencils, etc.) (CI)

SELF STICK PROTECTIVE FELT TABS (CI)

SEEDS OF ALL KINDS (USDA)

SEWING ACCESSORIES (needles of any type, thimbles, kindred articles, etc.) (CI)

SHAMPOO (FDA-C or D)

SHOELACES (CI)

SMALL ARMS AMMUNITION (CI)

SILVERWARE, STAINLESS STEELWARE, AND

PEWTERWARE (CI)

SMOKING PIPES (CI)

SOAP BARS WITH A DRUG CLAIM (including any claim for removing facial blemishes, etc. Refer to Detergent Bars for further discussion in this area.) (FDA-D)

SOAP DISHES (CI)

SOUVENIRS (CI)

SPORTING GOODS (CI)

STATIONERY AND WRITING SUPPLIES (looseleaf binders, paper tablets, etc.) (CI)

TEXTILES AND ITEMS OF WEARING

APPAREL (cloth laundry bags, towels, cheese cloth, shoe shine cloths, etc.) (CI)

TOBACCO AND TOBACCO PRODUCTS (pipes, cigarettes, etc.) (BATF - USDA)

TOOTHPASTE (FDA-D)

TOYS (CI)

TYPEWRITER RIBBON (CI)

WIRE OF ANY TYPE (CI)

WOODENWARE (CI)

## Report of the Specifications and Tolerances Committee

Jack Y. Jeffries, Chairman  
Consumer Protection Administration  
Division of Standards  
Florida

300

### Introduction

This is the Final Report of the Specifications and Tolerances Committee for the 79th National Conference on Weights and Measures. This report is based on the Interim Report offered in the Conference "Program and Committee Reports" (NCWM Publication 16), the Addendum Sheets issued at the Annual Meeting, and actions taken by the membership at the Voting Session of the Annual Meeting.

Table A identifies the items in the Report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Interim Meeting Agenda. Voting items are indicated with a "V" after the item number. Consent calendar items are marked with a "VC." Items marked with an "I" after the reference key number are information items. The items marked with a "W" were withdrawn by the Committee. Items marked with a "W" generally will be referred back to the regional weights and measures associations because they either need additional development, analysis, and input, or did not have sufficient support of the Committee to bring them before the NCWM.

The attached Report contains many recommendations to revise or amend National Institute of Standards and Technology (NIST) Handbook 44, 1994 Edition, "Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices." Proposed revisions to the handbook are shown in **bold face print** by ~~crossing out~~ what is to be deleted, and underlining what is to be added. Requirements that are proposed to be nonretroactive are printed in *italics*. Entirely new paragraphs or sections proposed for addition to the handbook are designated as such and shown in **bold face print**.

**Note:** The policy of the National Institute of Standards and Technology is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as they were submitted and may therefore contain references to inch-pound units.

Table A

### Index to Reference Key Items

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Table B					
Voting Results					
Reference Key No.	House of State Representatives		House of Delegates		Results
	Yes	No	Yes	No	
300 (Consent Calendar)	40	0	73	3	Passed
310-1	40	6	66	8	Passed
320-2	43	2	72	0	Passed
320-4	34	12	45	22	Passed
337-1	33	13	46	19	Passed
337-4A	40	0	73	0	Passed
337-4B	32	12	48	19	Passed
356-1	45	0	64	0	Passed
356-2	40	0	65	0	Passed
356-4 (Motion to Consider Amendment)	40	0	45	4	Passed
356-4 (Motion to Amend)	31	15	26	34	Failed
356-4 (Original Item)	40	3	62	0	Passed
356-5	45	0	57	0	Passed
360-2A	40	0	57	0	Passed
360-2B	25	13	24	31	Failed
300 (in entirety)	44	0	68	0	Passed

## Details of All Items

### General Code

#### 310-1 V G-UR.4.6. Testing Devices at a Central Location

(This item was adopted.)

**Source:** County of San Diego, California; Western Weights and Measures Association

**Recommendation:** To address problems that have been encountered when devices must be removed from service to permit transporting them to a central location for test, and to recognize centralized testing of devices normally transported for use, add a new paragraph G-UR.4.6., (a) and (b), to read as follows:

##### G-UR.4.6. Testing Devices at a Central Location. -

- (a) When weighing or measuring devices in commercial service must be removed from service to permit testing at a central location with appropriate facilities, or when the official with statutory authority requires commercial devices that are routinely transported for the purposes of use (e.g., vehicle-tank meters and scales transported to and used in seasonal markets) to be brought to a central location for testing, then the dealer or owner of the devices shall provide transportation of the devices to and from the test location.
- (b) When the request for the removal of and delivery to a central test location involves devices used in submetering, the owner or operator shall not interrupt the utility service to the customer or tenant except for the removal and replacement of the device. Provisions shall be made by the owner or operator to minimize the inconvenience to the customer or tenant. All replacement or temporary meters shall be tested and sealed by a weights and measure official or bear a current, valid approval seal prior to use.

**Discussion:** The submetering of commodities such as water, electricity, and hydrocarbon vapors is a common practice in many parts of the country and falls under the jurisdiction of State and local weights and measures agencies. Some weighing and measuring devices require specialized standards, test equipment, or controlled conditions for checking the accuracy of the device. For example, as a practical matter, vapor meters and water meters must be removed from service, transported to a central location, and tested where appropriate facilities and environmental conditions facilitate accurate testing. Enforcement officials have encountered problems with device owners or operators, particularly in mobile home parks, who refuse to remove the meters for testing or who interrupt utility service and threaten tenants for making complaints to weights and measures authorities. The paragraph is recommended to clarify the responsibilities of the device owner or operator.

In addition to the devices mentioned above, this requirement applies to devices that are transported as part of the normal use of the device, such as vehicle-tank meters and scales (often portable) used in seasonal or periodic markets (e.g., scales used in farmers' markets). The weights and measures official may require that devices that are routinely transported as part of their use be brought to a central location for test. The application of this requirement is to be limited to testing to determine compliance with Handbook 44 as part of the routine field enforcement programs of State and local jurisdictions; the Committee does not intend for this requirement to apply to the testing of scales installed in fixed locations (i.e., where devices are not moved in normal use although they may be portable). The requirement is not intended to apply to devices used in a fixed location when testing is to determine compliance with the influence factors requirements or to determine conformance with the design and performance of the original device submitted for type evaluation.

### 310-2 VC Definition of Security Seal

(This item was adopted as part of the consent calendar.)

Source: E.J. Brooks Company

**Recommendation:** To indicate that a physical wire security seal is not limited to lead-and-wire seals, amend the definition of security seal to read:

security seal. A ~~lead-and-wire~~ uniquely identifiable physical seal, such as a lead-and-wire seal or other type of locking seal, a pressure-sensitive seal sufficiently permanent to indicate reveal its removal, or similar device apparatus attached to a weighing or measuring device for protection against or indication of access to adjustment. (Also see "approval seal.")[1.10]

**Discussion:** Due to the health and environmental concerns regarding the use of lead, manufacturers offer security seals where the locking mechanism is made of plastic instead of lead. Although the definition does not preclude the use of plastic and wire security seals, some users of security seals interpret the definition as limiting them to lead-and-wire seals. The Committee believes that any type of security seal that effectively indicates that it has been broken or removed when sealable parameters have been accessed is acceptable as a security seal and may be used.

### 310-3 I User-Programmable Software; Manufacturer-Modified Software

Source: Carryover Item 310-4

**Discussion:** NTEP policy states that device manufacturers are to notify NTEP of any significant metrological changes to a device. NTEP will then determine with the manufacturer whether or not any part of the modified device requires further type evaluation. Weights and measures officials have experienced situations where the software has been changed, but the weights and measures representative for the company has not been informed of the change. In other cases, a type evaluation on systems using scales with NTEP Certificates of Conformance have been found to operate differently from the scales originally submitted for type evaluation; in one case, the modified software was not compatible with the equipment with which it was originally tested.

The software used in weighing and measuring devices is continually under development and revision. Weights and measures officials are concerned that the software evaluated during type evaluation is often changed before the devices are put on the market, or the software may be changed after the device enters production. Some software is written with flexibility to permit the user to customize the metrological operations of the software to the business operation.

Potential problems include:

1. revisions to software made by the manufacturer after the type evaluation;
2. different software offered on the same hardware, but for different applications;
3. software prepared by a software company to allow changes by the user when run on personal computers; and
4. software that is written specifically to facilitate modification by the user to customize the software to individual needs and preferences.

The Scale Manufacturers Association (SMA) explored different ways to respond to the concerns of weights and measures officials. Changing software is vital to the industry, enabling it to respond to the changing needs of customers. The scale manufacturers report that software is being written more frequently in a modular format, which lends itself to controlling changes to software and reducing unintentional changes to the metrological portion of the software. This approach to writing software permits code to be marked to alert subsequent programmers that the particular software relates to weights and measures regulatory control and should not be changed without adequate consultation. The SMA reported the following as its position regarding software.

SMA endorses the voluntary principle in software/firmware development that any metrologically significant code is to be marked or stored separately for easy identification. When the marked code is

modified in a metrologically significant way, NTEP is to be notified to determine if reevaluation is necessary.

The scope of this statement does not include any object code produced from the above source. However, final software used in type evaluation of the end product should be traceable to the source. The complete device remains subject to type evaluation.

Note: For purposes of this recommendation, "code" is defined as any source (human readable) software.

The Committee was advised that "object code" refers to code that has been through a compiler, but cannot be changed by the user.

The S&T Committee endorses the SMA statement regarding the goals for program design and identifying the metrologically significant portion of the software. The Committee believes that, in addition to this approach, weights and measures officials need more extensive examination procedure outlines and field manuals to identify to the inspector those critical features and device operations that must be checked in the field on each device to ensure the proper set-up and operation of the device. Many device parameters and features are selectable at the time of installation, but some are more critical than others. The most critical of these parameters and features should be checked during routine field inspections.

### 310-4 I G-UR.1.3. Selection Requirements; Suitability of Equipment

Source: Carryover Item 330-8

**Discussion:** Devices based upon differing technologies are used to measure the same products in the same wholesale and retail applications. Consequently, weights and measures officials must examine the suitability of equipment based upon the limits of inaccuracy (tolerance) that should be permitted for any given application. The specific codes define the performance (accuracy) required for a specific *device technology* or measurement application (for example, specific tolerances are stated for mass flow meters, retail motor-fuel dispensers, etc.); however, without further guidance, different tolerances are permitted in the same application. Item 330-8 in the 1993 S&T Committee report should be referenced for background information.

The Committee believes that work should continue to develop suitability of equipment requirements to promote the correct selection of equipment in different applications. Progress has been made on this issue over the years. The Committee requests that industry and regional weights and measures associations continue to study the following recommendations for possible adoption to the General Code.

#### *Liquid-Measuring Device Suitability in the General Code and Other Codes*

The Committee recommends the following user requirement and the table (on the next page) for study over the next year.

G-UR.1.3. Liquid-Measuring Devices. - To be suitable for its application, a liquid-measuring device shall satisfy the criteria in Table G-UR.1.3. for the specific application in which the device is used. The minimum delivery for any meter application shall be 100 divisions. The smaller tolerances for the acceptance and maintenance tolerances in Table G-UR.1.3. and the tolerances stated in the specific codes are used in the applications stated in Table G-UR.3.1. (See next page.)

To be considered *suitable* for a given application, the Committee believes that a liquid-measuring device must be accurate to at least the level specified in the table on the following page. It is proposed that the smaller of the two tolerances (the tolerance specified for the technology or the application tolerance) apply to a liquid-measuring device installed in a specific application. The changes to the General Code are recommended because the table spans several specific codes for liquid-measuring devices. A marking requirement may also be needed to identify the accuracy that a particular device is expected to meet.



Table G-UR.1.3. Suitability of Equipment Criteria for Liquid-Measuring Devices

Application or Commodity (Applicable to liquid measuring devices and mass flow meters)		Maximum Division Value <sup>1</sup> (d <sub>max</sub> )	Application tolerance	
			Acceptance Tolerance	Maintenance Tolerance
Loading rack meters	Refined petroleum products	1.0 L (1 gal) 10 kg (20 lb)	0.2%	0.3%
High volume motor-fuel dispensers (maximum discharge flow rates greater than 100 L or 25 gallon per minute)	Average delivery ≥ 80 L (20 gal) (e.g., Truck refueling)	0.1 L (0.1 gal) 1 kg (2 lb)	0.2%	0.3%
Vehicle-tank meters	Home heating oil, gasoline, diesel fuel	0.1 L (0.1 gal) 1 kg (2 lb)	0.2%	0.3%
	Milk and other food products	1 L (1 gal) 10 kg (20 lb)	0.2%	0.3%
Small volume motor-fuel dispensers (Analog)	Average delivery < 80 L (20 gal) (e.g., automobile refueling, motorboats)	0.01 L (0.01 gal*) 0.1 kg (0.2 lb)	0.3%	0.5%
Small volume motor-fuel dispensers (Digital)	Average delivery < 80 L (20 gal) (e.g., automobile refueling, motorboats)	0.01 L 0.01 gal 0.1 kg (0.2 lb)	0.3%	0.5%
Agri-chemical liquid		0.1 L (0.1 gal) 1 kg (2 lb)	0.3%	0.5%
LP Gas	Motor fuel and vehicle- tank-meter deliveries	0.1 L (0.1 gal) 1 kg (2 lb)	0.6%	1.0%
	Other deliveries	1 L (1 gal) 10 kg (20 lb)		
LP Gas (other than motor fuel and vehicle-tank meter deliveries), Anhydrous ammonia		1 L (1 gal) 10 kg (20 lb)	0.6%	1.0%
Mass flow meters	Compressed natural gas as an engine fuel	0.001 GGE 0.01 GLE (0.001 kg 0.001 lb)	1.5%	2.0%
Cryogenic liquid meters		1 L (1 gal) 10 kg (20 lb)	1.5%	2.5%
All other metering applications		1 L (1 gal) 10 kg (20 lb)	0.2%	0.3%
		0.01 L (0.01 gal) 0.1 kg (0.2 lb)	0.3%	0.5%
		0.001 L (0.001 gal) 0.01 kg (0.02 lb)	0.6%	1.0%

The tolerances apply to all temperatures, pressures, and flow rates as well as for all liquids specified by the manufacturer.

\*Nonretroactive in terms of new models of devices for measuring motor fuels.

<sup>1</sup>Mass units apply to only mass flow meters.

Item 337-5 for mass flow meters should be referenced to see a related approach to this concept. A significantly smaller tolerance for agri-chemical meters has been included in the table for discussion purposes. Over the years comments have suggested that the agri-chemical meter tolerances should be smaller based upon the high cost of the products. The Committee is considering a separate item in its 1995 agenda to change the tolerances for agri-chemicals to an acceptance tolerance of 0.3 percent and a maintenance tolerance of 0.5 percent.

### Scales Code

#### 320-1 I Unattended Vehicle Scales: S.1.14., UR.3.10., Definition

Source: Carryover Item 320-10

**Discussion:** An increasing number of unattended vehicle scales are used for commercial transactions and for determining the axle loads of highway vehicles. Many jurisdictions are faced with applying current Handbook 44 requirements to these devices, but apply different requirements based upon their interpretations of Handbook 44. The definition of "direct sale" was changed in 1993 to recognize transactions using automated or customer-operated devices to be direct sale transactions.

In 1992, the SMA submitted its recommendations for requirements for unattended vehicle scales, recommending the following:

**Definition:** unattended vehicle scale. Axle, full, or multi-platform scale which is available for use without the presence of the owner/user.

**Features:** The scale shall provide an indication that the scale is at "zero" and stable or ready to weigh. If this indication is not present, any weighing operation shall be inhibited.

All weight data must be recorded unless the displayed weight completes the transaction.

There must be an indication when the weighing operation is completed.

- Notes:**
1. Since the scale owner has chosen to have the scale unattended, he must provide for his own interest through the use of gates, barricades, sensors, etc.
  2. If the scale is driver-operated, it is the driver's responsibility to see that his vehicle is correctly positioned on the scale.

The S&T Committee believed that additional requirements should apply and developed requirements in addition to those submitted by the SMA. In its report for the 1993 Annual Meeting, the S&T Committee recommended several new requirements for unattended vehicle scales. (See Item 320-10 in the 1993 S&T report.) The main differences of the two proposals are summarized below.

SMA Recommendations	S&T Committee Recommendations
The scale must provide a "zero" indication, which may be as simple as a traffic light.	S.1.1 was amended in 1993 to allow alternative indications of zero, but the zero indication must be defined under G-S.6. Marking.

SMA Recommendations	S&T Committee Recommendations
Printer is required only if the weight display does not complete the transaction.	A printer is required and a weight ticket must be issued. The weighing operation shall be inhibited if the printer is not functioning. The ticket must include the scale location, time and date of weighing, and cost of the weighing service if a fee is charged.
The owner has the responsibility to ensure that the weighing operation is properly executed and has the option to provide gates, sensors, etc., to protect his or her interests for vehicle being correctly positioned on the scale; the vehicle driver has the responsibility of properly positioning the vehicle on the scale platform.	The scale must incorporate gates, sensors, etc., to verify that the vehicle is properly loaded before the weighing operation can be performed.
A weight display visible to the driver is not required; the weight information may be stored in memory and invoiced directly to the other party of the transaction. The driver is not to be considered the "agent" of the other party.	Under General Code G-UR.3.3., a weight display for the driver is required.

The SMA and individual scale manufacturers oppose the proposed S&T changes. The Western reported that the S&T proposal appeared to conflict with sections 10.(12) and 11.(a)(2) of the Uniform Weighmaster Law and may also violate individual State weighmaster laws. Section 10.(12) requires a public weighmaster to sign the weight certificate resulting from the weighing operation; section 11.(a)(2) specifies that a public weighmaster shall enter only the measurement values personally determined, which would effectively prohibit the use of unattended vehicle scales in applications where public weighmasters are required.

#### ***SMA Position***

The SMA gave a presentation at the 1994 Interim Meeting to explain its position and provide examples to illustrate applications where they believed the proposed requirements were impractical and unnecessary. The major issues are whether or not (1) a weight display should be required, (2) a printer (and printed weight tickets) should be required, and (3) safeguards should be required to ensure that the vehicle is properly positioned on the scale platform for weighing.

SMA reported that many different output devices are in use today on unattended vehicle scales. These include cut-bar ticket printers, scoreboard displays, computers systems, remote video display terminals, traffic lights, traffic gates, and other devices. SMA reported that many scales do not have weight displays for the driver because the driver may be an independent hauler who does not represent either the buyer or the seller. It was reported that many of these unattended scales are installed in locations and environments where customer displays would be subject to severe conditions and damage. It is the scale manufacturers' position that the drivers do not need a weight display since the customer is billed, often electronically, hence the weight display is an unnecessary expense. Similarly, a printer is an unnecessary expense since the weights for transactions will be transmitted to the other party in the transaction by invoice or electronic billing. A printer will be difficult to maintain in an operable condition: experience suggests that drivers intentionally damage and destroy printers despite the efforts of businesses to protect the equipment.

#### ***S&T Concerns***

Weights and measures officials must reconcile the facts that a vehicle driver is generally considered the agent for the party who does not own the scale; that many of these transactions are considered direct sales under the definition in Handbook 44; and that General Code paragraph G-UR.3.3. requires a customer weight display. If an independent driver is not considered to be the agent for the party who doesn't own the scale, then a clarifying interpretation may be needed to distinguish when a truck driver represents the second party in a direct sale transaction and when the driver does not. The SMA proposal would allow scales not to have a weight display, which conflicts directly with

G-UR.3.3. If this type of transaction is interpreted to be an indirect sale, then a customer weight display is not required and the printed ticket is sufficient; however, there is concern that in transactions normally considered a direct sale, the customer is not provided with sufficient information to verify the transaction and safeguard against fraudulent operations. To provide the party who does not own the scale with sufficient information to verify the weighing operations on an unattended scale, the Committee considered that the printed record for each weighing operation would be an effective method by which the invoice or electronic billing could be verified.

The SMA brought up numerous points that should be addressed. The Committee has looked at this issue for several years without making substantial progress. At this point, the Committee considers this issue to be of low priority. If weights and measures officials feel strongly that more effort is warranted, then the regional weights and measures associations should continue to develop this issue. Unless greater interest is demonstrated by weights and measures officials, the S&T Committee will likely discontinue work on this issue.

### **320-2 V Concentrated Load Capacity: S.6.5., S.6.5.1., Definition**

(This item was adopted.)

**Source:** Carryover Item 320-13; Mettler-Toledo, Inc.

**Recommendation:** Amend the definition of the concentrated load capacity to read:

**concentrated load capacity (CLC).** A capacity rating of a vehicle, axle-load, or livestock scale, specified by the manufacturer, defining the maximum load concentration for which the weighbridge is designed. In the case of vehicle and axle-load scales, it is the maximum axle-load concentration (for a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet) for which the weighbridge is designed as specified by the manufacturer. The concentrated load capacity rating is for both test and use.[2.20]

**Discussion:** The main objectives of defining the concentrated load capacity and requiring its marking are (1) to advise the scale user of the maximum loads that can be accurately weighed on the scale and (2) to establish a uniform method of rating the axle-load capacity of a scale to provide a consistent basis for competition among companies.

**History:** The recommendation to change the definition of concentrated load capacity (CLC) is another effort to achieve a universal understanding that the CLC is to be equal to the maximum axle load for which the manufacturer has designed the scale and which may be routinely weighed on the scale as part of normal use. When this issue was first addressed by the Committee in 1987, there was a concurrent issue regarding the acceptable concentration of test loads on a scale without damaging the scale platform.

The concern in 1987 (Item 320-6) was that the rating of section capacity did not reflect the actual amounts that could be accurately weighed when placed anywhere on the scale platform. Additionally, there was interest in relating the scale capacity to the section capacity and the number of sections in the scale. As a result of further study with the industry, the S&T Committee in 1988 recommended a definition of "concentrated load capacity" to replace the use of section capacity and related the nominal capacity of a scale to the CLC and the number of sections (Item 320-5A).

When designing a scale, the manufacturer must decide what axle loads are to be weighed and for which vehicles and their axle configurations. The Committee wanted the concentrated load capacity to apply to both the axle loads of vehicles and the test loads that could be applied anywhere on the scale; hence, the Committee included the last sentence of the definition, which reads "This capacity rating is for both test and use." To respond to the concern that test loads up to the CLC be adequately distributed on the scale platform to avoid damage to the platform, a test pattern for block weights was developed to ensure that the load would not be excessively concentrated (Item 320-5B). The prescribed test pattern was incorporated in the Scales Code test note N.1.3.4. The different ways loads are applied to a scale create different stresses within the weighbridge; the force per unit area is much less for the prescribed test pattern than for a loaded vehicle on wheels.



In 1991 the definition was changed again to further clarify that the CLC is to reflect the axle load for which the scale is to be used. The following sentence was added to the definition of the CLC: "In the case of vehicle and axle-load scales, it is the maximum axle-load concentration for which the weighbridge is designed as specified by the manufacturer." The Committee considered including a statement regarding the different types of vehicles and axle configurations that could be weighed, but the reference was deleted at the Annual Meeting in 1991.

#### *Group of Two Axles Provides Basis for Comparisons*

For the 1994 Interim Meeting, the Committee received a proposal to relate axle loads and the different vehicle axle configurations through the Federal Highway Administration Bridge Gross Weight Formula B and an "r factor." The Committee received a second proposal suggesting that a separate definition for a dual axle rating be added to Handbook 44 and that the definition of CLC be modified so that it applied to only the test of a scale. The Committee opposed a separate definition for a dual axle rating because it had always intended for the CLC and axle-load ratings to be the same. However, since the definition of CLC did not address the various axle configurations, the Committee decided to specify in the definition that the CLC is to be established based upon a group of two axles with a specific spacing. This is an effort to provide a consistent basis for manufacturers to rate their scales. The axle spacing is for rating the scale with its CLC; it does not restrict the types of vehicles that may be weighed on the scale provided that the loading does not exceed the corresponding axle load weights computed from the Federal Highway Administration Bridge Gross Weight Formula B (see below).

#### *Other Axle Configurations*

The Committee concluded that the r factor had merit, but decided not to include it in Handbook 44 due to concern that it may be too complex for field enforcement and the ratings would be difficult to assess. However, the r factor may be a basis for scale purchasers to compare CLC ratings for vehicle scales and to relate the CLC to the types of vehicles and axle configurations that will be weighed by the scale owner. Since the r factor and the Federal Highway Administration Bridge Gross Weight Formula B establishes a way to convert axle ratings for groups of more than two axles to an equivalent rating for a group of two axles, the Committee decided to specify that the CLC be based upon a group of two axles with the specified spacing. Consequently, scale companies may use the r factor to relate the CLC rating to vehicles with other axle configurations to aid the scale purchaser to select the appropriate scale for the application.

To make the relationship of the r factor available for comparison purposes, the relationship of the r factor and the Federal Highway Administration Bridge Gross Weight Formula B is stated below.

**Scale Load Limits.** - The manufacturer shall specify the scale load limits for consecutive vehicle axles according to the Federal Highway Administration Bridge Gross Weight Formula B, as modified by the "r" factor:

$$W = r \times 500 \left[ \left( \frac{LN}{N-1} \right) + 12N + 36 \right]$$

where    W is the maximum load in pounds carried on any group of two or more consecutive axles;  
           r is the factor assigned by the manufacturer that specifies the maximum load;  
           L is the distance in feet between the first and last axle of that group; and  
           N is the number of axles of that group, where  $N \geq 2$ .

For a single axle, the weight limit is  $W = r \times 20,000$ .

### **320-3            I            N.2.1. Weight Recertification Time Interval**

**Source:** Southern Company Services

**Discussion:** The Committee received a proposal to specify a recertification time interval for "in-place" test weights. In-place test weights are installed and stored indoors at the location of the scale and are moved in only a vertical direction when raised and lowered to test the scale. Because these weights are stored indoors, they are not subject



to the wear and abuse of weights transported from location to location and which are often used in environments that could change the mass of the test standards. The proposal suggested a 5-year recertification period for in-place weights and a method to assess when weights would have to be tested more frequently.

The Committee supports the concept of an extended recertification period for stationary weights that are protected from the elements, but does not believe the recertification period should be stated by the Conference or placed in Handbook 44. The recertification is a policy decision to be made in each jurisdiction based upon the assessment of its weights and measures laboratory program and requirements for the registration of service agencies.

### **320-4            V            N.3. and Table 4. Minimum Test Weights and Test Loads**

(This item was adopted.)

**Source:** Illinois; California; Western Weights and Measures Association

**Recommendation:** Amend Table 4 to state the minimum test weights and test loads as shown on the following page.

**Discussion:** In July 1993 the S&T Committee added Item 320-15 to its report to respond to requests to delay the change of N.3. to a mandatory status. Numerous State and local jurisdictions have reported that the government agency and scale service companies within their jurisdictions are unable to comply with the minimum values required effective January 1, 1994. On the other hand, several other jurisdictions have reported that they and scale service companies within their jurisdictions have purchased new equipment and modified other equipment to meet the test requirements. Some jurisdictions that have not been able to purchase or modify equipment have indicated that they will take two test trucks to scales in order to meet the test requirements.

The Committee concluded that changes should be made to Table 4 to reflect current practices and to make the mandatory requirements more practical by reflecting common practices. Additionally, the Committee recommends adding a note regarding safety that will serve as a "grandfather clause" to circumvent the need to modify buildings to accommodate the larger amount of test weights that became mandatory for large capacity scales as of January 1, 1994. The explanatory notes were changed to clarify the application of the weights specified in the table. A brief summary of the changes is provided.

#### ***Recommended Changes to Table 4***

The capacity of scales in the first capacity range was increased from 50 to 150 kg (100 to 300 lb) because most officials carry enough weight to test these scales to capacity. If officials do not now carry sufficient weights to test 300-lb scales to capacity, then the Committee believes that they should in order to be able to test these scales to capacity.

The second range of capacities in Table 4 (151 to 1500 kg) were changed to be more practical in the amount of test weights required, particularly since the upper limit of the scale capacity was raised to 1 500 kg (3 000 lb). The percentage of test weights needed as a function of the scale capacity was reduced from 50 percent to 25 percent. In addition, the maximum test load required for these scales has been reduced to 75 percent since some larger scales may not be used to capacity. The test note in the far right column now applies to this range of scale capacities because the required minimum test load is below the capacity of the scale (to 75 percent of capacity).

The third range of scale capacities (1501 to 20 000 kg) had the lower limit changed to coincide with changes made to the second range. The total amount of test weights required as a percentage of scale capacity was also reduced to reflect practical considerations. The specific minimum quantity of test weights (500 kg or 1 000 lb) was increased (from 250 kg or 500 lb) due to the increase in the lower limit of the scale capacities.

For the large capacity scales (capacities greater than 20 000 kg or 40 000 lb), the minimum amount of test weights required was retained as 12.5 percent of capacity or 5 000 kg (10 000 lb). The Committee believes that the specified amounts of test weights and test loads are needed as a minimum to conduct an adequate test on large capacity scales.

**Table 4.**  
**Minimum Test Weights and Test Loads<sup>1</sup>**

Device capacity	minimums (in terms of device capacity)		(where practicable)
	Test weights (greater of)	Test loads*	
0 to <del>50</del> 150 kg (0 to <del>100</del> 300 lb)	<del>105%</del> 100%		
<del>51 to 500 kg</del> <del>(101 to 1 000 lb)</del> 151 to 1 500 kg (301 to 3 000 lb)	<del>50% or 50 kg</del> <del>(100 lb)</del> 25% or 150 kg (300 lb)	<del>105%</del> 75%	Test weights to dial face capacity, 1 000d, or test load to used capacity, if greater than minimums specified  <u>During initial verification, a scale should be tested to capacity.</u>
<del>501 1 501 to</del> 20 000 kg ( <del>1 001 3 001 to</del> 40 000 lb)	<del>25% or 250 kg</del> <del>(500 lb)</del> 12.5% or 500 kg (1 000 lb)	50%	
20 001 kg+ (40 001 lb+)	12.5% or 5 000 kg (10 000 lb)	<del>25%</del> 25% <sup>2</sup>	

<sup>1</sup>If the amount of test weight in Table 4 combined with the load on the scale would result in an unsafe condition, then the appropriate test load will be determined by the official with statutory authority.

\*The term "test load" means the sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution ~~or buildup~~ test methods. Not more than three substitutions shall be used during substitution testing, after which the tolerances for strain load tests shall be applied to each set of test loads.

<sup>2</sup>The scale shall be tested from zero to at least 12.5% of scale capacity using known test weights and then to at least 25% of scale capacity using either a substitution or strain load test that utilizes known test weights of at least 12.5% of scale capacity. Whenever practical, a strain load test should be conducted to the used capacity of the scale. When a strain load test is conducted, the tolerance applies only to the known test load.

~~Except for railway track scales, the minimum test of a class III L scale shall consist of one test from zero to at least 25% of the scale capacity and then one strain load test to at least the used capacity of the device.~~

~~Each test is to be conducted using a known test load of at least 25% of scale capacity. This test load may be comprised entirely of test weights or a combination of a test weights equal to at least 12.5% of scale capacity and a substitution load.~~

(Amended 1988, 1989)

Since many companies and States have upgraded their equipment to meet these minimum requirements, the Committee believes that the Conference would compromise its credibility by reducing this requirement. However, the Committee was made aware that the vehicles used to transport 25 000 lb of test weight have a gross weight, when empty, of approximately 27,000 lb, which precludes using the empty truck as part of a substitution test to achieve a test load of 25 percent of scale capacity (for vehicle scales with a capacity of 200 000 lb). Since the Committee still advocates that large capacity scales be tested through the first 25 percent of the weighing range (in

addition to testing to the used capacity of the scale), a test note was added for the test load to indicate that a strain load test may also be used to satisfy this requirement when testing large capacity scales.

The last change to Table 4 deals with safety and "grandfathering" scales inside buildings that utilize in-place weights to test the scale. Since safety must be a prime consideration when testing any scale, the minimum test load requirements must be modified whenever unsafe conditions would exist during the test of a scale. In these cases, the weights and measures official will decide when safety considerations preclude adding the minimum required amounts of test weights and test loads.

Under this safety consideration, it is the intent of the Committee to effectively exempt existing installations of scales, normally hopper scales, from the minimum test weights requirement if the structure of the building would have to be modified to support the additional amount of test weight mandated by N.3 and Table 4. The structural limitations of the building are considered to be a safety issue and would exempt existing installations from the minimum test weight requirement. The minimum test load requirement should still be satisfied, because the scale and building are designed to weigh loads up to the capacity of the scale.

### 320-5 VC UR.1.5. Selection Requirements; Suitability of Equipment

(This item was adopted as part of the consent calendar.)

Source: Carryover Item 320-7

**Recommendation:** The Committee believes that additional criteria are needed to aid in determining the suitability of equipment for specific applications. These guidelines are recommended for use, but will not appear in Handbook 44. In response to comments the Committee has received, the Committee has revised the language to limit the guidelines to class III scales only. The Committee recommends that the following be adopted as guidelines to help select the correct scale for a given application or assess the appropriateness of scales already installed.

#### Suitability of Division Value for Loads Weighed

To be suitable for its application, a class III scale shall have a division value such that the requirements of the following table are satisfied for the minimum and average loads weighed on the scale.

Range of Scale Capacities	Average Net Load	Minimum Net Load
Capacities up to and including 1000 kg (2500 lb)	<i>average net load <math>\geq 100d</math></i>	Table 8 applies
Capacities greater than 1000 kg (2500 lb)	<i>average net load <math>\geq 500d</math></i>	

### 320-6 W UR.3.7. Minimum Load on a Vehicle Scale

(This item was withdrawn.)

Source: Oregon; Western Weights and Measures Association

**Recommendation:** Eliminate the net load requirement of 50d and return to the gross load requirement of 50d by changing UR.3.7. to read:

**UR.3.7. Minimum Load on a Vehicle Scale.** - A vehicle scale shall not be used to weigh ~~net~~ gross loads smaller than 50d.

~~(a) 10d when weighing scrap material for recycling;~~

~~(b) 50d for all other weighing.~~

~~As used in this paragraph, scrap materials for recycling shall be limited to ferrous metals, paper (including cardboard), textiles, plastic, and glass.~~

**Discussion:** A waste management company as a vehicle scale to weigh all trucks dumping solid waste at landfills. The company reported that a significant number of customers dispose of solid waste in quantities less than 1000 lb. The minimum net load to be weighed on a vehicle scale (excluding scrap metal for recycling) is 50d, or 1000 lb when using vehicle scales with 20-lb divisions. It wishes to charge customers for the actual weight of the waste dumped, but charges minimum fees for quantities less than 1000 lb due to the minimum load requirement. The company submitted an analysis showing that it could obtain additional revenue if the higher rate-per-ton fee were used for loads up to 1000 lb instead of applying the minimum charge.

The Committee considered whether to add another exemption to UR.3.7. for the weighing of solid waste at landfills or perhaps remove the minimum net load requirement in its entirety. The Committee does not like the idea of adopting a requirement and then having an extensive list of exemptions. The Committee is concerned that continual granting of exemptions will lead to additional requests. Several States have reported that the minimum load requirement for vehicle scales has been preempted by State legislative action. The Committee also questioned whether or not jurisdictions are actively enforcing this requirement.

The Committee concluded that the most effective way to deal with this issue was to recommend removal of the minimum net load requirement. The Committee encourages industry and weights and measures officials to study this proposal and provide comments if they do not agree with the recommendation and if they would rather see a list of exemptions maintained for this requirement. Changing the minimum load requirement to clearly apply to net loads has been a controversial issue over the years. The history of the issue is presented for reference.

### *History*

The 1000-lb minimum load for vehicle scales was adopted in 1937. The requirement applied specifically to gross loads, although consideration was also given to minimum net loads. The main motivation for the 1937 discussion was the relationship of the minimum tolerance to the gross load, primarily as it related to weighing bags of coal on a vehicle scale. The errors due to rounding to the nearest division were not considered.

In the early 1980s, the scale industry considered adoption of OIML criteria for scales. These criteria included recommended minimum loads for scales of different accuracy classes. The minimum load requirements were based upon both the tolerance applicable to the scale and the error associated with rounding weight values to the nearest scale division. The maximum effect of the round-off error can be computed by dividing  $\pm 0.5d$  by the gross load in divisions, then converting to a percentage of the gross load. For example, an error of  $\pm 0.5d$  at 20d represents 2.5 percent of the load being weighed; for a load of 10d, the round-off error can be as large as 5 percent of the load. The recommended minimum load on a class III scale is 20d, which can have a potential round-off error of  $\pm 0.5d$  or 2.5 percent. In 1984 the Conference adopted recommended minimum load criteria for scales marked with an accuracy class. The requirements were part of the revision to the Scales Code tolerances which took effect in 1986.

The issue of a minimum net load on vehicle scales was first addressed by the NCWM in the 1987 S&T Report (Item 320-24). Because the net weight on a vehicle scale is determined by performing two weighing operations, both of which are rounded to the nearest division, the maximum potential round-off error is  $\pm 1d$ . Consequently, a minimum net load that is greater than 20d can be justified. For example, a minimum net load of 40d would give the same 2.5 percent potential error on a net load for a vehicle scale as for a single weighing operation on a class III scale at 20d. (Note that if tare is taken to the internal resolution of the scale rather than to the displayed resolution of the scale, as on a computing scale, then the potential round-off error relative to the net load remains at  $\pm 0.5d$ . Because vehicle scales must have mathematical agreement of gross, tare, and net weights, the gross and tare weights must be rounded to the displayed division.) The minimum net load requirement was adopted in 1988 (Item 320-17) and was expressed as 50d.



The exemption for scrap material for recycling was adopted in 1992. The justification was based upon the cost of handling the material compared to the value of the scrap and the desire to facilitate recycling to reduce waste and pollution.

### 320-7 I Criteria for Automatic Weighing Systems

Source: Carryover Item 320-12

**Discussion:** The Working Group on Automatic Weighing Systems has held two meetings and has made great progress in defining the scope of devices for which type evaluation criteria are being developed. Specific design specifications have been identified to recognize the needs of the users of these systems. Test procedures are being developed and tolerances for static and dynamic testing are near completion. Specific recommendations for changes to Handbook 44 to address a broad scope of automatic weighing systems (including those systems referred to as "checkweighers") are expected next year. The primary objective is to assist the U.S. Department of Agriculture and the companies they regulate regarding devices used to determine or verify the net contents of packaged products. Consideration may ultimately be given to devices for other applications, such as scales in conveyor lines to check or determine shipping rates for packages.

### 320-8 VC S.6.3., Table S.6.3.(b) Counting Scales

(This item was adopted as part of the consent calendar.)

Source: Carryover Item 320-11

**Recommendation:** The Committee recommends that counting features be permitted on commercial scales provided that the count feature is identified as "not legal for trade." Amend note 13 of Table S.6.3.(b) to read:

13. *A scale designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and customer restricting its use to that application, e.g., postal scale, prepack scale, weight classifier, etc.\* When a scale is installed with an operational counting feature, the scale shall be marked on both the operator and customer side with the statement, "The counting feature is not legal for trade." [\*Nonretroactive as of January 1, 1986]*

**Discussion:** The SMA examined the possibility of developing criteria for counting scales. Since other countries permit counting features to appear on commercial scales without specific criteria, the SMA recommends that counting features be allowed on approved weighing systems with a permanent label stating that the counting feature has not been approved for use in trade. The S&T Committee is concerned that the counting feature not be used commercially. If there are no specific criteria for issues such as selecting an appropriate sample size, the variation of the individual weight of the objects to be counted, accuracy tolerances for the count, and the representation of displayed information, then there can be no criteria and procedures with which to assess the performance of counting scales. Consequently, the Committee recommends that specific language be placed on scales installed in commercial applications to indicate clearly that the counting feature is not to be used for commercial trade. If this change is adopted and the count feature is permitted to appear on commercial devices, controlling the use of the counting feature will be left to enforcement.



## **Belt-Conveyor Scale Systems**

### **321 I N.3.3.1. Minimum Test Loads for Simulated Load Tests**

**Source:** Southern Company Services; Southern Weights and Measures Association

**Discussion:** The Committee reviewed the proposal to define parameters for conducting simulated load tests on belt conveyor scales. The following language has been adopted by the American Railway Engineering Association (AREA) Committee 34.

N.3.3.1. Minimum Test Loads for Simulated Load Tests. - The simulated load test shall be conducted using test weights equal to at least 60 percent of the static scale capacity without the use of multiplying levers. The test weights may be placed on the belt or directly on the weighbridge under the belt.

The methods of conducting simulated load tests and the amount of test weight applied to the belt-conveyor scale vary greatly. The proposal describes the manner in which the load is to be applied to the belt-conveyor scale and would eliminate the use of multiplying levers to obtain an effective test load. Applying weight directly to the weighbridge or to the belt more accurately reflects actual use. It should be noted that this proposal would not prohibit the use of electronic calibration to check the electronics of the belt-conveyor system in addition to the simulated load test. The issue of electronic calibration is a separate issue from that of the simulated load test.

The Committee did not have sufficient technical justification for making a decision on this item. Moreover, the Committee questioned whether or not it is necessary for Handbook 44 to specify procedures and parameters for simulated load tests, which are not considered official tests; only material tests are official tests. The test notes for simulated load tests were removed from the Belt-Conveyor Scales Code in 1989 partly because they were not official tests. At that time the Committee decided that any simulated load test recommended by the manufacturer could be used to monitor the performance of the scale.

If technical justification is provided, the Committee will reconsider whether or not parameters for simulated load tests are needed to more accurately monitor the on-going performance of belt-conveyor scales. In the absence of this information, the Committee made this an information item and does not intend to pursue the issue unless additional justification is provided.

## **Liquid-Measuring Devices Code**

### **330-1 VC S.2.1. Vapor Eliminators on Loading Rack Meters**

(This item was adopted as part of the consent calendar.)

**Source:** Shell Oil

**Recommendation:** The Committee recommends adding a new paragraph S.2.1.1. as follows:

#### **S.2.1.1. Vapor Elimination on Loading Rack Meter Systems.**

- (a) A loading rack metering system shall be equipped with a vapor or air eliminator or other automatic means to prevent the passage of vapor and air through the meter unless the system is designed or operationally controlled by a method, approved by the weights and measures jurisdiction having control over the device, such that air and/or vapor cannot enter the system.

- (b) Vent lines from the air or vapor eliminator (if present) shall be made of metal tubing or other rigid material.

**History:** The Liquid-Measuring Devices Code (LMD) currently requires that all liquid-measuring devices be equipped with a vapor or air eliminator or other automatic means to prevent the passage of vapor and air through the meter. Comments have been received that many loading rack terminals are designed to eliminate the presence of vapor or air in the system. Internal or external floating pans are often used to prevent the addition of vapor to the product supply. Companies also use internal floating suction lines designed with an elbow to keep the suction pipe below the liquid level. The systems are designed to keep a positive suction head to prevent vaporization of the liquid at the pump, and companies use centrifugal pumps specifically designed to avoid collection of vapor. Piping is designed to ensure that temperature changes permit liquid to flow freely in or out of the tank.

Comments indicated that requiring air eliminators is an unjustified cost since other steps have been taken to prevent the introduction of vapor into the measurement system. Moreover, air eliminators introduce a risk (especially in unmanned operations) of discharging product to the environment, thereby causing pollution.

The Committee recognized that jurisdictions require air eliminators because it is not typically feasible to verify that other means are effective; however, the effectiveness of the air eliminators and the associated piping is not typically verified by weights and measures. The Committee believes that alternatives to requiring an air eliminator should be permitted provided that alternative means are automatic in operation. The Committee agreed that any alternative means should be reviewed and approved by the weights and measures jurisdiction having authority over the system. The Committee decided to delete the term "effective" since the alternative means must be effective in order to satisfy the requirements of the paragraph.

The Committee will develop guidelines to assist jurisdictions in evaluating the effectiveness of means alternative to an air eliminator for preventing the passage of vapor and air through the meter. Representatives from Canada's Legal Metrology Branch have provided a copy of the minimum criteria established by their agency for assessing these systems. The Committee plans to forward the Canadian guidelines to the regional weights and measures associations for additional input on appropriate criteria. After finalizing the guidelines, the Committee will present them to the NCWM for use by jurisdictions to assess systems for compliance with S.2.1.1.

### **330-2      VC      S.5.1., S.5.2., UR.4.1., and UR.4.2., Totalizers and Sealing of Totalizers**

(This item was adopted as part of the consent calendar.)

**Source:** NCWM S&T Committee

**Recommendation:** In September 1993, the S&T Committee recommended that weights and measures jurisdictions delay enforcement of Liquid-Measuring Devices Code paragraphs S.5.1., S.5.2., UR.4.1., and UR.4.2. until the NCWM had another opportunity to review the Handbook 44 language in July 1994.

Based on the number of questions surrounding this issue, it is apparent that the adopted language is not adequate to ensure consistent interpretation in the weights and measures community. To ensure consistency and to ensure that the intent of the NCWM is clear, the Committee believes that requirements adopted for totalizers on retail motor-fuel dispensers must be modified. The Committee recommends modifications to paragraph S.5.1., UR.4.1., and UR.4.2. as follows:

*S.5.1. Totalizers for Retail Motor-Fuel Dispensers. - Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer ~~for to cumulatively register the quantity delivered through the metering device.~~*  
*[Nonretroactive as of January 1, 1995. ~~To become retroactive January 1, 199X.~~]*

**Delete paragraphs S.5.2.; UR.4.1.; UR.4.2.**

**History:** At the 78th Annual Meeting in July 1993, the NCWM voted to include several paragraphs relating to totalizers on retail motor-fuel dispensers in the Liquid-Measuring Devices Code of Handbook 44. Since then a number of questions were raised concerning the language adopted for totalizers, the intent of the NCWM in adopting that language, and how the requirements would be interpreted and enforced by weights and measures officials, particularly when a dispenser has both an electronic and a mechanical totalizer.

A memorandum dated September 21, 1993 was sent to State weights and measures directors by Mr. Jack Jeffries, Chairman, NCWM S&T Committee, outlining some of the concerns. The S&T Committee recommended that the regional weights and measures associations address the issue of what constitutes an acceptable physical security seal for mechanical totalizers, and discuss whether or not the requirement should be made retroactive at a later date. In his letter, Mr. Jeffries also reviewed the following questions and provided responses from the S&T Committee and weights and measures officials.

### *Issues Regarding the Sealing of Totalizers*

- 1) If a device is equipped with both electronic and mechanical totalizers, must both totalizers meet requirements for sealing? (For example, if the electronic totalizer is non-resettable, must the mechanical totalizer also be capable of being sealed?)

The language adopted in paragraph S.5.1. requires that retail motor-fuel dispensers (RMFDs) be equipped with a nonresettable totalizer. This does not specify whether the totalizer must be mechanical or electronic; therefore, either type would be acceptable.

Paragraph S.5.2. requires that a mechanical totalizer on a device must be equipped with provisions for sealing. This would apply to any mechanical totalizer on a device, regardless of whether or not the device is equipped with a nonresettable electronic totalizer. Since the requirements for electronic and mechanical totalizers are in separate paragraphs, both must be satisfied if both types of totalizers are present. Therefore, technically, the answer to the question posed is yes; however, the S&T Committee did not consider the case when dispensers are equipped with both an electronic and mechanical totalizer. The Committee stated in its report that one or the other is acceptable. The Committee believes that the intent of the NCWM was to require dispensers to have at least one sealable or non-resettable totalizer; the Committee believes that having one sealable or nonresettable totalizer would satisfy weights and measures officials.

- 2) What criteria must be met by an electronic totalizer in order for it to be considered "nonresettable"?

It is the opinion of the S&T Committee that it should not be possible to reset the totalizer in the normal operating mode or through a programming or setup mode that is accessible through a security code or password. (If the totalizer can only be reset by a process that erases all dispenser programming or by replacing the main printed circuit board, the totalizer would be considered to meet the requirements. This is consistent with the five philosophies for sealing noted in the 1992 final report of the S&T Committee.) The totalizer information must be retained in the event of a power failure and, if equipped with a battery back-up, must not lose its information if the battery is disconnected; this method of operation is similar to that required for retaining audit trail information.

- 3) Would an audit trail be acceptable for an electronic totalizer?

Under General Code paragraph G-S.8. and LMD Code paragraph S.2.2., the minimum form of audit trail specified for RMFDs would be interpreted as being acceptable for monitoring changes to an electronic totalizer. This means that an electronic totalizer on a RMFD equipped with two event counters may be resettable if one of the event counters increments each time the totalizer is reset. Weights and measures officials may not be comfortable with this situation for a totalizer that is not intended to be reset to zero.

**4) What is considered to be an acceptable method for sealing a mechanical totalizer?**

Weights and measures officials currently recognize the use of such physical security seals as lead-and-wire, plastic-wire, and destructible pressure-sensitive. Mechanical totalizers on some RMFDs have been sealed in the past using an epoxy substance to prevent tampering with the totalizer connections; the epoxy seal is not typically imprinted with a mark which could be used as a means to determine whether or not someone has tampered with the totalizer connections.

Many gasoline tax or revenue divisions have historically accepted the epoxy seal for sealing mechanical totalizers. Now that requirements for totalizers have been included in Handbook 44, it will be necessary for weights and measures to determine whether or not seals such as the epoxy seal are acceptable for this purpose.

Initial reactions have indicated that some weights and measures officials are unwilling to accept epoxy seals since they do not provide evidence of tampering as is provided by other types of physical security seals. Other weights and measures officials have indicated willingness to accept the epoxy seal for the purpose of sealing only totalizers (i.e., epoxy is not acceptable on adjustment mechanisms or other sealable parameters), provided that their gasoline tax or equivalent department would be satisfied with this type of security seal.

***Sealing Compared With "NonResettable" Requirements***

At the Interim meeting, the Committee reviewed, in addition to its own original proposal, a proposal from the Western Weights and Measures Association. The Committee also reviewed a proposal from the Northeastern and Southern Weights and Measures Associations; the Measuring Sector of the National Type Evaluation Technical Committee indicated their support for this proposal. The S&T Committee agreed to recommend adoption of the latter proposal rather than its original proposal.

The Committee recognizes that some jurisdictions strongly believe that totalizers should be sealed. The Measuring Sector expressed concerns that the provision to require sealing is too broad. There are many differing opinions on what constitutes an acceptable means of sealing a totalizer, including the type of security seal (e.g., wire seal or epoxy) and at what point(s) the seals must be placed. S&T Committee members also noted that physical limitations in the design of a retail motor-fuel dispenser make it difficult to access the components of the totalizer which might need to be sealed and also make it difficult to seal the device in such a way that routine operation of the device will not destroy the seal. S&T Committee members also noted reports from some tax revenue agencies indicating that sealing the totalizer did not provide significant benefit. No specifications are defined for totalizer capacity and the information collected from them may be of limited value; even totalizers with a capacity of 999,999 units can "roll over" in a week in a busy service station.

The Measuring Sector expressed the opinion that, without additional specifications, totalizers should not be sealed; the only requirement should be that a totalizer be "nonresettable." The S&T Committee agreed with the Measuring Sector's assessment that additional specifications for totalizers would not be of sufficient benefit to justify the time and effort that would be required for their development.

The Committee noted that there are different interpretations of the term "nonresettable." The Committee agreed that the intent of the term is to indicate that the totalizer cannot be reset by use of a push button. The Committee recognizes that it is possible to reset a totalizer by other than a push button (e.g., mechanically turning the totalizer backward with a drill hooked to the cable); however, if means other than a push button are required to reset the totalizer, then the totalizer is considered nonresettable.

**330-3 I T.2.3.4. Automatic Temperature Compensating Systems; Accuracy of the Temperature Sensor**

**Source:** Carryover Item 330-5

**Discussion:** The Committee is retaining this item as an informational item to allow additional time for data to be collected on the use of small volume provers. The issue of compact provers was discussed at the October 1993



meeting of the National Type Evaluation Technical Committee (NTEC) Measuring Sector. Mr. Tim Scott, Brooks Instruments, is working on a project to compare the performance of a small volume prover with that of a conventional neck-type prover. It is expected that some of the difficulties that might be typically be encountered in the testing of temperature compensating systems when using a compact prover might be observed during this testing. It is noted that these devices are currently accepted for use in routine field tests, and for use in NTEP evaluations; Mr. Scott seeks eventual NCWM acceptance through the NCWM Metrologists' Group.

The Committee would appreciate additional input to develop and resolve this issue, particularly information on how accurately the temperature of the product used in the test can be determined and how the lag time in the response of the temperature probe is addressed.

The S&T Committee originally specified the tolerance for automatic temperature compensating systems in terms of the meter test results for compensated and uncompensated runs because the location of the temperature probe in many loading rack systems is often at a considerable distance from the meter. In addition, many installations do not have a thermometer well adjacent to the temperature probe that can be used to compare the accuracy of the system temperature probe to a reference thermometer. The normal test draft for the application of the tolerance is a neck-type, large volume prover.

The Committee received comments indicating that the tolerance expressed in T.2.3.4. is not practical when small volume provers are used. The Committee understands the term "small volume prover" to refer to a compact prover rather than to a neck-type prover of a smaller capacity. Due to the small size of the test draft when small volume provers are used, the tolerance as a percentage of the test draft is too small to be used to check the accuracy of the temperature probe. The Committee was asked to consider expressing the tolerance for a temperature probe in degrees, such as 1 °C (2 °F), particularly when small volume provers are used to test meters, and to consider specifying all tolerances for automatic temperature compensating systems as a temperature value instead of a deviation in the test results for the compensated and uncompensated test results.

Some members of industry expressed opposing views to these comments, indicating that evaluating the performance of the temperature probe alone and permitting a tolerance of 2 °F is excessive, indicating that the proposal would inappropriately relax the tolerances. Comments at the Interim Meeting indicated that it is reasonable to specify a tolerance for the temperature probe, but the variance should be no more than 0.5 °C or 1 °F.

During the discussion, it was pointed out that the temperature taken by a small volume prover is not representative of the temperature of the entire delivery: it represents only the temperature of the product at a given time during the delivery. The performance of the probe represents only part of the overall performance of the measuring system. Consequently, it was stated that the application of the tolerances as currently written is inappropriate for small volume provers and should be changed as proposed.

The American Petroleum Institute has provided to the S&T Committee four sections from its Manual of Petroleum Measurement Standards to assist the Committee in its understanding of the design and use of small volume provers. The Committee has received input concerning typical sizes of small volume provers and has identified typical configurations used in the applications addressed by paragraph T.2.3.4.

The Committee also received information from Mr. Chuck Michell, Shell Oil Company, concerning the potential difference in product temperature if the temperature probe for the metering system is not adjacent to the meter. He noted that API Chapter 7.2. indicates "Where it is impractical to mount the temperature sensor in the meter, it should be installed either immediately downstream or upstream of the meter... Where several meters are manifolded in parallel, one temperature sensor located in the total liquid stream is acceptable,... providing the temperature agrees within 1.0 °F of the meter temperature."

The Committee is considering the addition of a definition for small volume prover as follows. It is noted that small volume provers may be used in a wider variety of applications and available in more configurations than specified in this definition; the definition limits the scope of the term for the purposes of reference in Handbook 44.



## Specifications and Tolerances Committee

small volume prover. - A stationary or portable testing device (prover) that has a known volume between detectors of less than 100 gallons, provides for less than 10,000 direct pulses from the meter during a single pass of a displacer between detectors, and is used to test the performance of meters with a discharge rate in excess of 300 gallons per minute. The small volume prover measures product in a dynamic state and typically uses pulse-interpolation or similar techniques to achieve high resolution. Small volume provers are sometimes referred to by the trade name "compact prover."

The Committee is also considering modifying T.2.3.4. as follows to address the application of tolerances when a small volume prover is used.

*T.2.3.4. Automatic Temperature Compensating Systems. - Except for tests performed using a small volume prover, the difference between the meter error for results determined with and without the automatic temperature compensating system activated shall not exceed:*

- (a) 0.2 percent of the test draft for mechanical automatic temperature compensating systems; and*
- (b) 0.1 percent of the test draft for electronic automatic temperature compensating systems.*

*The results of each test shall be within the applicable acceptance or maintenance tolerance.  
[Nonretroactive as of January 1, 1988.]*

When testing is performed using a small volume prover, the temperature probe shall be accurate to within  $\pm 0.5^{\circ}\text{C}$  ( $1^{\circ}\text{F}$ ).

### 330-4 I T.4. Repeatability Tolerances

**Source:** Accurate Metering Systems

**Recommendation:** Concern has been expressed that the repeatability tolerance for vehicle tank meters is too restrictive when acceptance tolerance applies. As an example, on a 405-gallon indication applying acceptance tolerance, a device must repeat within 40% of  $\pm 0.492$  gallons, which is 45.5 cubic inches. As an alternative, a proposal was made to modify existing paragraphs or add new paragraphs as appropriate in all codes in Section 3.0 to specify repeatability requirements as follows:

The repeatability for multiple tests conducted at approximately the same flow rate shall not exceed 40 percent of the maintenance tolerance.

The Southern recommended modifying only paragraph T.4. of the Vehicle-Tank Meters Code (VTM) to exempt milk-measuring systems:

**T.4. Repeatability.** - (Except for Milk-Measuring Systems) When multiple tests are conducted at approximately the same flow rate, the range of the test results for the flow rate shall not exceed 40 percent of the applicable tolerance.

**Decision:** The Committee believes that the tolerances are acceptable as currently written. The Committee does not feel that sufficient data has been submitted to justify changing the current repeatability tolerances; no data has been provided to indicate how closely devices in the field are repeating or the extent to which current repeatability tolerances are being exceeded.

The Committee has heard concerns from some weights and measures officials that the repeatability tolerance for liquefied petroleum gas meters might be too stringent on small (e.g., 25-gallons) test drafts. However, no data has been provided to support an acceptable alternative.

The Committee is maintaining this as an informational item; however, it will be withdrawn from the Committee's 1995 agenda unless additional information is provided to support changes to the tolerances. Additional background information on the issue is provided below.

In 1992, the NCWM adopted repeatability tolerances for tests conducted at approximately the same flow rate. Paragraphs were added to the LMD Code (for retail and wholesale devices), the VTM Code, and the LPG and NH<sub>3</sub> Code. A repeatability requirement was added to the tentative Mass Flow Meters Code as a separate item. The addition of repeatability tolerances to the other codes in Section 3.0 was not discussed.

It has been noted that the repeatability tolerances adopted in 1992 are not identical for all devices; the repeatability tolerances are summarized below:

Retail Meters:	"40 percent of the <u>maintenance</u> tolerance"
Wholesale Meters, VTMs, LPG & NH <sub>3</sub> Meters:	"40 percent of the <u>applicable</u> tolerance"
Mass Flow Meters:	"0.2 percent of the measured quantity"

The S&T Committee had recommended the larger "40 percent of the maintenance tolerance" for retail devices in recognition that tests of retail motor-fuel dispensers were typically performed using 5-gallon test measures. Applying 40 percent of acceptance tolerance would result in an unreasonably small tolerance of 1½ cubic inches. The Committee felt that the readability of the prover and conditions in the field were not adequate to ensure application of the tolerance with a high degree of confidence. The Committee recommended "40 percent of the applicable tolerance" for other devices because the Committee felt that other devices should be able to easily perform within these limits. The repeatability tolerance for mass flow meters is based on the OIML requirements for these devices.

### Vehicle-Tank Meters Code

#### 331-1 VC S.1.1.3. Value of Smallest Unit

(This item was adopted as part of the consent calendar.)

Source: Southern

Recommendation: Modify paragraph S.1.1.3. as follows:

**S.1.1.3. Value of Smallest Unit.** - The value of the smallest unit of indicated delivery, and recorded delivery if the meter is equipped to record, shall not exceed the equivalent of:

- (a) 0.5 L (4-pt 0.1 gal) or 0.5 kg (1 lb) on milk-metering systems and on meters with a rated maximum flow rate of 500 L/min (100 gal/min) or less used for retail deliveries of liquid fuel for domestic use, or
- (b) 5 L (1 gal) or 5 kg (10 lb) on other meters.

**Discussion:** Paragraph S.1.1.3. currently restricts the division size of a vehicle-tank meter (VTM) used for retail deliveries of liquid fuel for domestic use to 0.5 L (1 pint) or less. Devices included in the Handbook definition for a retail device include those devices used for single deliveries of less than 380 liters (100 gallons) and retail deliveries of motor fuels to individual highway vehicles.

Concern has been expressed that the division size of VTMs commonly used in airports have been found to be larger than 0.5 L (0.1 gal). In view of the reference to "fuel for domestic use," the Handbook does not clearly require the smaller division size on these devices. However, the size of the delivery for these devices is often less than 380 liters (100 gallons). Similar ambiguity exists for VTMs used to fuel (non-highway) construction vehicles where the delivery is less than 380 liters (100 gallons), but the fuel is not for domestic use. The Committee agrees that a division size greater than 0.5 L is not suitable for these applications. The Committee also agreed that the reference to 1 pint should be deleted and the closest gallon equivalent indicated instead (i.e., 0.1 gal); the Committee believes that this is more appropriate since most devices indicate in terms of decimal gallons.

**331-2            W            Table 1. Tolerances for Vehicle-Tank Meters Except Milk Meters, Agri-Chemical Meters, and Mass Flow Meters**

(This item was withdrawn.)

Source: Western

**Background:** The Committee reviewed a proposal to replace Table 1 Tolerances for Vehicle-Tank Meters Except Milk Meters, Agri-Chemical Meters, and Mass Flow Meters in the Vehicle-Tank Meters (VTM) Code with the tolerances specified for wholesale devices in the Liquid-Measuring Devices Code. The proposal was intended to provide consistency between the two codes, for ease of use, and to recognize that the same meter can be used in both applications. The tolerance structure of the VTM Code provides a tolerance of a fixed number of cubic inches for all test drafts and an additional number of cubic inches based on the indicated amount. The LMD Code specifies a tolerance strictly as a percentage of the indicated amount. Both tolerance structures result in a tolerance that varies according to the indicated amount.

A comparison of tolerances for the same make and model of meter used in both applications (LMD and VTM) show that the LMD Code is tighter for **maintenance tolerance** than the VTM Code for a 380 liters (100-gallon) draft, but the opposite is true for a 3000-liter (800-gallon) draft. For **acceptance tolerance**, the LMD Code is less stringent than the VTM Code for both a 380-liter (100-gallon) draft and a 3000-liter (800-gallon) draft.

**Decision:** The Committee believes that the tolerances are acceptable as currently written and, consequently, has withdrawn this item from its agenda. The Committee is concerned that the proposed change would lead to relaxed tolerances for a large number of applications covered by the Vehicle-Tank Meters Code. Many tests are run above 380 liters (100 gallons) and the tolerances for tests drafts in this range would be larger than the tolerances specified for these drafts in the current code. Devices in the field meet the current tolerances, and the Committee feels that insufficient data or other technical justification has been submitted to justify raising the tolerances.

The Committee noted that many regions may be interested in seeing the tolerances in this code expressed in terms of a percentage; the Committee is willing to consider changing the tolerances to a percentage of the test draft, if they are more consistent with the magnitude of the tolerance currently included in the VTM code.

**331-3            VC            UR.2.2. Ticket Printer; Customer Ticket**

(This item was adopted as part of the consent calendar.)

Source: Petroleum Marketer's Association of America (PMAA)

**Recommendation:** Modify paragraph UR.2.2. as follows:

**UR.2.2. Ticket Printer; Customer Ticket. - Vehicle-mounted metering systems shall be equipped with a ticket printer which shall be used for all sales where product is delivered through the meter. ~~The ticket printer shall be used for all sales;~~ a copy of the ticket issued by the device shall be left with the customer at the time of delivery or as otherwise specified by the customer.**  
[Nonretroactive as of January 1, 1995. To become retroactive as of January 1, 1999.]

**Discussion:** In 1992, the NCWM voted to add paragraph UR.2.2. to require a ticket printer on VTMs and to ensure that customers receive a printed ticket for the transaction. The paragraph recognizes that most customers are not present during a delivery from a VTM and are entitled to receive timely information about the details of the transaction.

PMAA expressed concern that the language adopted in UR.2.2. could be interpreted as imposing unnecessary restrictions on bulk deliveries of product. For example, "bulk drops" of product in which the entire truck load of product is dropped at a single location are often made to retail service stations. The service station is provided with a copy of the loading ticket printed by the meter at the loading terminal. It was noted that UR.2.2. could be

interpreted to require **all** deliveries (including what would typically be a drop delivery) to be run through the meter; running the entire load through the meter would require more time than the drop delivery.

An additional point of concern raised by PMAA was the requirement to leave a copy of the ticket with the customer at the time of the delivery. Examples where leaving the ticket is not practical include deliveries to rental properties where the landlord has asked to have the ticket left elsewhere or mailed, and rural deliveries to farm tanks where there is no building in which to leave the ticket. In its previous discussions on this issue, the S&T Committee felt very strongly that the customer is entitled to receive a copy of the ticket for every transaction; this includes budget-billing customers, who should have a record of individual deliveries to compare with the periodic invoice. If a customer specifically requests to have the ticket mailed or left at other than the delivery location, the Committee recognized that an exception may be made at the discretion of the weights and measures jurisdiction. The Southern felt very strongly that this was not intended to be a blanket exception extended to all customers, but an exception to address specific instances where the customer requests a variation from the normal practice of leaving the ticket at the delivery site.

Some jurisdictions were satisfied with the language as currently written; the S&T Committee agrees that the current language does not require every delivery to be made through the meter mounted on the truck. However, the S&T Committee believes that modifications to the existing language are needed to ensure that the paragraph is interpreted and applied consistently by all jurisdictions. The Committee also believes that the proposed changes will help to ensure that the paragraph is applied as originally intended by the NCWM.

## Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Code

### 332-1            I            T.3. Automatic Temperature-Compensating Systems; Accuracy of the Temperature Sensor

Source: Carryover Items 332-1 and 330-5

**Recommendation:** See Item 330-3 for background discussion on the liquid-measuring devices issue corresponding to this item. The Committee is considering modifying paragraph T.4. of the LPG and Anhydrous Ammonia Code as follows to address the application of tolerances when a small volume prover is used. The Committee is also considering the addition of a definition for a small volume prover as specified in LMD Item 330-3.

T.4. Automatic Temperature Compensating Systems. - Except for tests performed using a small volume prover, the difference between the meter error for results determined with and without the automatic temperature-compensating system activated shall not exceed:

- (a) 0.5 percent of the test draft for mechanical automatic temperature-compensating systems; and
- (b) 0.25 percent of the test draft for electronic automatic temperature-compensating systems.

The results of each test shall be within the applicable acceptance or maintenance tolerance.

When testing is performed using a small volume prover, the temperature probe shall be accurate to within plus or minus 0.5 °C (1 °F).



## Cryogenic Liquid-Measuring Devices Code

### 334-1 I S.2.4. Automatic Temperature or Density Compensation

**Source:** Carryover Item 334-1; Compressed Gas Association; Air Products and Chemicals, Inc.

**Discussion:** In 1992 the following proposal was submitted to reverse the action taken in 1991 which required cryogenic metering systems to be equipped with automatic temperature or density compensation systems and to inhibit the meter system operation if the ATC system fails.

S.2.4. Automatic Temperature or Density Compensation. - If a device is ~~shall be~~ equipped with automatic means for adjusting the indication and/or recorded representation of the measured quantity of the product, it shall ~~to~~ indicate and/or record in terms of: kilograms or pounds; liters or gallons of liquid at the normal boiling point of the specific cryogenic product; or the equivalent cubic meters (cubic feet) of gas at a normal temperature of 21 °C (70 °F) and an absolute pressure of 101.325 kPa (14.696 psia). ~~When a compensator system malfunctions, the indicating and recording elements may indicate and record in uncompensated volume if the mode of operation is clearly indicated, e.g., by a marked annunciator, recorded statement, or other obvious means.\*~~

*[\*Nonretroactive as of January 1, 1992]*

#### CGA Position

Mr. Lionel Wolpert, representing the Compressed Gas Association (CGA), gave a presentation at the 1993 Interim Meetings in support of rescinding the mandatory use of automatic temperature-compensating systems on cryogenic metering systems, contending that automatic compensation is a design requirement.

It is the CGA position that the requirements for automatic temperature or density compensation for the meters is unnecessary, restrictive, and costly from both operational and maintenance perspectives. Other methods are available to ensure consistency in meeting the tolerances. The CGA contends that the tolerances specified in the Code can be and are being met using meters that do not have temperature or density compensation. The Code should be a performance standard, not a design manual.

The Compressed Gas Association reports that a narrow pressure range exists for trailers to pump discharge their lading (the most common delivery mode). This range is mandatory in order to prime and retain the pump prime during transfer, yet not exceed the pressure rating of the trailer as maintained by the pressure relief valve. These operating parameters limit the maximum temperature of the cryogenic product being delivered and metered.

Approximately 75 percent of the 1900 cryogenic meters in commercial use in the United States are not compensated for temperature or density. The cost of replacing or modifying present metering systems to incorporate temperature or density compensation ranges from \$600 to \$3000 per meter. Maintenance costs also increase due to additional instrumentation and hardware. Much of this maintenance cost is due to the rigors of road vibration, particularly for the temperature sensor.

#### Committee Concerns

The Committee analyzed the data provided in Mr. Wolpert's presentation along with the report of the meter testing conducted by the State of California. Two points were major considerations to the Committee, as follows:

**Point 1:** The California data indicate a much higher rejection rate for non-temperature-compensated meters (34 percent) than for temperature-compensated meters (9 percent). The CGA did not have the California comments prior to the Interim Meetings and was unable to assess and explain such a large difference in rejection rates in the California data. The Committee concluded that temperature-compensated meters appeared to have greater accuracy than uncompensated meters.



The CGA has since responded to the California comments, indicating that it believes that higher rejection rate of nontemperature-compensated meters is due to the age of the meters and the lack of maintenance performed on them. The CGA noted that temperature-compensated meters are a fairly recent introduction, first available around 1989, in contrast to non-temperature-compensated meters, which have been available for over 18 years.

In a recent letter, California responded that it does not have data to verify the ages of the meters rejected or approved. However, they indicate that temperature-compensated meters have been approved and in service in California since 1977. They also note that it is common practice for device users to rebuild older cryogenic meters rather than replace them; the rebuilding keeps only the original exterior metal casing and electronic housings. California also noted that active, regular enforcement, such as its program for cryogenic meters, helps to ensure regular maintenance, whether voluntary and routine or enforced due to rejection of a meter.

**Point 2:** This point is based upon the effects of pressure on the accuracy of the measurement, as provided by Mr. Wolpert in his presentation. The variation of pressure from 5 to 25 psig changes the liquid volume correction factor from approximately -1.5 percent to 2.3 percent. The CGA contends that, since this is less than the meter tolerance, automatic temperature compensation should not be required. The S&T Committee noted that the acceptance tolerance on cryogenic meters is 1.5 percent; the maintenance tolerance is 2.5 percent. Since the effect of pressure (and therefore temperature) can have an effect greater than the acceptance tolerance, automatic temperature compensation can certainly be justified. The fact that the liquid volume correction varies over almost the entire range of the maintenance tolerance means that there is little provision for meter error. Consequently, the Committee was not persuaded that the requirement for a mandatory temperature or density compensating system should be deleted.

In response to this point, the CGA noted that the accuracy data presented at the 1993 Interim Meetings was an example for extreme cases where the liquid-saturated pressure could vary. The extremes ranged from 5 psig up to the Department of Transportation limit of 25 psig for a nonspecification trailer (cryogenic trailers fall into the nonspecification category). The ranges were selected to illustrate that even with these extremes in liquid temperature, the maintenance tolerance of the code would be met. The CGA recognizes that the meter should be calibrated at the normal operating pressure of the meter (typically 15 psig); the acceptance tolerance applied minimizes calibration maintenance for the meter.

California expressed concern in its recent letter that calibrations are often performed at the temperature of the product at the time of calibration. For deliveries made at other product temperatures, California is concerned that delivery errors may exceed tolerances. In addition, the data in the extreme examples of 5 psig to 25 psig would assume that the meter error is zero. California's experience indicates that saturation pressures in excess of those specified in UR.2.7. are not uncommon in normal operations encountered by its field inspectors.

The Committee agreed in July 1993, the CGA will have to provide additional information to justify further consideration of its proposal to rescind the requirement adopted in 1991. The Committee is reluctant to propose changes to the requirements which were adopted in 1991 until information can be provided to indicate that changes are warranted.

The CGA arranged for test demonstrations in Baltimore in November 1993 and in Virginia in December 1993, to gather additional data to present to the S&T Committee. Representatives from the S&T Committee, Maryland Weights and Measures, and NIST were present to witness the testing and discuss the concerns of the CGA. At the 1994 Interim Meeting, the CGA expressed concern that some of the data gathered at the S&T demonstrations was tainted. The S&T Committee wants to see data that is not questionable. The Committee wants to see data witnessed by weights and measures officials, preferably members of the Committee. In order to enable the Committee to adequately address the issue, the data should include a wide range of variables, including (where possible): a range of pressures from 10 psi to 23 psi with ATC activated and with ATC deactivated; fast tests and slow tests; and a range of temperatures. The Committee agreed to leave this as an informational item to give the CGA and other interested parties an opportunity to provide additional input.

(See also Items 334-1 and 334-2 in the 1991 the S&T Committee final report for additional background information.)

## Milk Meters Code

### 335-1 VC Diversion of Measured Product

(This item was adopted as part of the consent calendar.)

Source: Accurate Metering Systems

**Recommendation:** The scope of this proposal was originally intended to apply only to mass flow meters used to dispense milk; however, the language developed for the proposed paragraph did not limit its application to mass flow meters. In reviewing the proposed language, the Committee agreed that it is appropriate to extend the scope of its original proposal to milk meters which use other types of metering technology. Since such language would require that adequate safeguards be provided to prevent diversion of measured product, the Committee also believes these provisions should be extended to devices covered by the Liquid-Measuring Devices Code.

Modify paragraph S.3.1. as follows:

**S.3.1. Diversion of Liquid to be Measured.** - No means shall be provided by which any liquid can be diverted from the supply tank to the receiving tank without being measured by the device. A manually controlled outlet that may be opened for purging or draining the measuring system shall be permitted. Effective means shall be provided to prevent passage of liquid through any such outlet during normal operation of the measuring system.

If the status of the Mass Flow Meters Code is changed to a permanent code, the provisions of the Mass Flow Meters Code will apply to mass flow meters used to deliver milk. Since the language proposed by the Committee in S.3.1. is not limited to Mass Flow Meters, the paragraph will remain in the Milk Meters Code and will apply to other types of metering technologies used to deliver milk. If the proposed changes to paragraph S.3.1. are adopted by the NCWM, the Committee plans to recommend in 1995 that the NCWM consider incorporating similar language in the Liquid-Measuring Devices Code.

**Discussion:** When incorporating a Coriolis-type mass flow meter into a receiving or load-out system for milk product, milk derivative, or food product, the air must be thoroughly purged prior to beginning the measurement. Coriolis-type mass flow meters become unstable during transition from an empty tube to a full tube. Concern has been expressed that it is not possible to achieve consistent measurement on start-up from an empty system. It is noted that other types of metering technology, such as positive displacement meters, must satisfy the same conditions; however, it has been suggested that the accuracy of other types of technology are not affected by the start-up conditions as significantly as the mass flow meter.

Sanitary systems, such as those used to measure milk, must be cleaned out and washed at least once per day. In addition, the system must be emptied and refilled between successive loads of different products, such as condensed skim milk and cream. Consequently, a typical milk metering system must frequently make the "empty" to "full" transition as part of its normal operation.

It has been proposed that an outlet for purging or draining the system be permitted, with the condition that effective means be provided to prevent passage of liquid through this outlet during normal operation. A meter must not register or record product while the manually controlled outlet diverts measured product. The proposal would enable the system to circulate product until the metering system is full of product, at which time normal metering operation could be initiated. Another advantage of this provision would be that unmetred product remaining in the system could be salvaged by running it back into the receiving tank.

The tentative Mass Flow Meters Code recognizes the effects on mass flow meter performance of transitioning from an empty to a full system. Paragraph S.4.1. of the Mass Flow Meters Code currently includes language similar to that suggested above for addition to the Milk Meters Code.

The intent of paragraph S.3.1. is to prevent product from being diverted after the measurement. Diversion of measured product bases the sale upon an amount other than actually received by the purchaser. If means are provided to prevent diversion from occurring during normal system operation, the intent of paragraph S.3.1. would be satisfied. In order to ensure that the intent of the paragraph is satisfied during all normal deliveries, it is necessary to stipulate that the "effective means" (e.g., interruption of meter registration) must also be automatic in operation and interlocked with the operation of the meter. This ensures that the meter will not indicate or record quantity values while the manual outlet is in operation.

During the Interim Meeting, the Committee noted that there are similar concerns for mass flow meters falling under the Liquid-Measuring Devices (LMD) Code. As with the Milk Meters Code, the LMD Code does not now include language corresponding to paragraph S.4.1. of the Mass Flow Meters Code. The Committee agreed that a change similar to that proposed for the Milk Meters Code would be appropriate for the LMD Code.

### Mass Flow Meters Code

#### 337-1 V S.1.2.2. Units of Measure for Natural Gas When Sold as an Engine Fuel

(This item was adopted.)

Source: Carryover Item 337-2, Natural Gas Vehicle Coalition

**Recommendation:** The Laws and Regulations (L&R) Committee and the S&T Committee are coordinating their actions regarding the method of sale of compressed natural gas (CNG) when sold as an engine fuel. The L&R Committee establishes the method of sale for CNG sold as a motor fuel, but the S&T Committee must establish the specifications for the equipment used to sell CNG as a motor fuel. Assuming that the L&R Committee recommendation to sell CNG on the basis of a gasoline liter equivalent and a gasoline gallon equivalent will be accepted by the NCWM, the S&T Committee recommends the following changes to the Mass Flow Meter Code. If the Mass Flow Meter Code is not adopted as a full code, then the requirements (if adopted) will be added in appropriate places to the Hydrocarbon Gas Vapor-Measuring Devices Code.

Add the following definitions to Handbook 44.

**natural gas.** 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. [3.37]

**gasoline liter equivalent (GLE).** Gasoline liter equivalent (GLE) means 0.678 kilograms of natural gas. [3.37]

**gasoline gallon equivalent (GGE).** Gasoline gallon equivalent (GGE) means 5.660 pounds of natural gas. [3.37]

Add a new paragraph S.1.2. to require that CNG dispensers be of the computing type and that an indication of mass be available.

**S.1.2. Compressed Natural Gas Dispensers.** - Except for fleet sales and other price contract sales, a compressed 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.

Add a new paragraph S.1.2.1.1. to require quantities of CNG sold as an engine fuel to be indicated in units of gasoline volume equivalents, renumber current S.1.2., S.1.2.1., S.1.2.2., S.1.2.3. and S.1.2.4. respectively.

**S.1.2.1.1. 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" (see definitions).

Amend paragraph S.1.2.3.(b) to specify the maximum division value that may be used for gasoline volume equivalents, such that money values will be computed to one cent values. Hence, whole dollar amounts will not be skipped for unit prices up to at least \$10 per GGE and at least \$4 per GLE.

**S.1.2.3. Maximum Value of Quantity-Value Divisions.**

- (a) The maximum value of the quantity-value division for liquids shall not be greater than 0.2 percent of the minimum measured quantity.
- (b) ~~The maximum value of the quantity-value division for vapor measuring devices shall not exceed 0.01 lb (0.01 kg) when measuring product as a retail motor fuel.~~ For dispensers of compressed natural gas used to refuel vehicles, the value of the division for the gasoline liter equivalent shall not exceed 0.01 GLE; the division for gasoline gallon equivalent (GGE) shall not exceed 0.001 GGE. The maximum value of the mass division shall not exceed 0.001 kg or 0.001 lb.

Add a new paragraph S.5.1. to require that the gasoline volume equivalent units be defined in mass units and marked on the face of the dispenser.

**S.5.1. Marking of Gasoline Volume Equivalent Conversion Factor.** - A device dispensing compressed natural gas shall have either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

**Discussion:** See Item 232-4 in the Laws and Regulations Committee Report for the related issue addressing the method of sale of CNG as an engine fuel.

Last July, the weights and measures community seemed inclined to require CNG dispensers to indicate quantities in mass units; however, the Natural Gas Vehicle Coalition (NGVC) took a unified position opposing the use of mass units. They stated that the use of mass units would not be meaningful to consumers and would not facilitate value comparisons with gasoline. Both the L&R and S&T Committees agreed to study this issue over the following year.

A meeting was held on September 1, 1993, to discuss the method of sale of CNG as an engine fuel. The NGVC is uniformly behind the concept of selling CNG based upon the "gasoline gallon equivalent." The average energy content of gasoline is approximately 114,000 BTUs per gallon. The BTU content of gasoline varies with the brand and blend of the product and from season to season. Similarly, the BTU content of natural gas varies regionally across the country and varies with the source of supply. Attempting to establish and maintain a precise conversion between the energy content of gasoline and natural gas and to maintain and verify the relationship was considered to be an unrealistic task at the retail level. The NGVC opposed the sale of CNG in mass units in that it would not help the consumer and would detrimentally affect public acceptance of this alternative fuel. The question regularly posed was, "How does the sale of CNG in mass units help the consumer?"

Defining the GLE and GGE on the basis of mass would enable weights and measures officials to test the CNG dispenser gravimetrically. Since most CNG dispensers currently installed use mass flow meters to measure the product, the dispenser could be tested by converting the GGE indication to mass units by multiplying the GGE quantity by 5.660 lb/GGE. The NGVC opposed adding a separate display in mass units for the purposes of test because the conversion factor would be fixed by this relationship. However, weights and measures officials were interested in having either a separate display of mass (which could be hidden behind a removable panel) or having a button on the dispenser that would momentarily switch the display from GGE to mass units. Such a display



enables weights and measures officials to verify the conversion factor used in the device between routine performance tests.

Item 337-2 in the 1993 S&T Committee report should be referenced to understand the basis for the relationship of 1 GLE being set equal to 0.678 kg of CNG and 1 GGE being set equal to 5.660 lb of CNG.

### *Discussion of the Changes*

**Definitions:** The definition of natural gas limits the scope of these device requirements to devices used to sell natural gas as a motor fuel. The objective is to limit the use of the GLE and GGE to the sale of CNG as a motor fuel, that is, these units may not be used when natural gas is sold for any other purpose. The definitions of GLE and GGE define these marketing units in terms of mass.

**S.1.2. Compressed Natural Gas Dispensers:** The Committee wants to ensure that CNG dispensers available for use by the general public are of the computing type. Although Handbook 44 does not explicitly require gasoline dispensers available to the general public to be of the computing type, computing-type dispensers have been used for so long that they are now considered required under suitability of equipment. Additionally, the Committee recommends that a display of mass units be required on the dispenser so that the accuracy of the conversion factor between mass and gasoline volume equivalents can be checked at any time without actually performing a meter test and that mass units are made available when meter accuracy is checked. The indication of mass may be in a separate display or in the customer's quantity display by pressing a button or other convenient mechanism available to the weights and measures official. The button or the display may be on the outside of the device or inside the cabinet of the device.

**S.1.2.1.1. Compressed Natural Gas Used as an Engine Fuel:** This paragraph specifies that all CNG sold as an engine fuel shall be indicated in gasoline volume equivalents as defined in the definition section of Handbook 44. To provide consumers with a uniform method of sale (as established by the L&R Committee), all CNG dispensers must indicate in the same units. The GLE and GGE appear to be useful to facilitate taxing this engine fuel in the same manner as gasoline and diesel fuel. A CNG dispenser indicating in only mass units would not be acceptable under the L&R recommended method of sale and this specification.

**S.1.2.3. Maximum Value of Quantity-Value Divisions:** Handbook 44 does not require gasoline dispensers to compute to every one cent value, but the oil companies and service stations apparently want consumers to be able to make purchases to every whole dollar amount. To prevent the problem of inadequate computing capability in CNG dispensers, the Committee recommends adding this requirement so manufacturers of these dispensers will be aware of the potential problem and, thereby, prevent an enforcement problem from occurring at a later date. Since CNG is already priced as high as \$.89 per GGE (including taxes), prices in excess of \$1.00 per GGE are possible in the foreseeable future.

**S.5.1. Marking of Gasoline Volume Equivalent Conversion Factor:** Since new marketing units have been created for the sale of CNG as an engine fuel, it is important that the consumer be able to relate the marketing units to standard measurement units. Because these units are defined in mass units, these mass equivalents must be marked on the face of the device.



**337-2 VC T.2. and T.3. Tolerances**

(This item was adopted as part of the consent calendar.)

Source: Carryover Item 337-5

**Recommendation:** To respond to the criticism that the mass flow meter tolerance provides an unfair advantage to mass flow meters used in the same applications as other types of meters, it is proposed that the tolerances specified in paragraphs T.2. and T.3. be replaced by a new paragraph T.2. and accompanying table of accuracy classes for different applications. Make the repeatability tolerances for mass flow meters consistent with the repeatability tolerances for other metering devices addressed in other specific codes by amending the current paragraph T.4. (and renumbering it as T.3. below). The tolerance for liquid retail motor-fuel devices is specified as 40 percent of the maintenance tolerance, whereas the remaining devices have a tolerance of 40 percent of the applicable tolerances. To aid in determining the suitability of equipment of a meter for different applications, the accuracy class to which a meter is expected to perform shall be marked on the device. Add a new subparagraph (e) to S.5. and renumber the subparagraphs that follow.

**S.5. Markings.** - A measuring system shall be legibly and indelibly marked with the following information:

- (a) pattern approval mark (i.e., type approval number);
- (b) name and address of the manufacturer or his trademark and, if required by the weights and measures authority, the manufacturer's identification mark in addition to the trademark;
- (c) model designation or product name selected by the manufacturer;
- (d) nonrepetitive serial number;
- (e) the accuracy class of the meter as specified by the manufacturer consistent with Table T.2.;\*
- (f) maximum and minimum flow rates in pounds per unit of time;
- (g) maximum working pressure;
- (h) applicable range of temperature if other than -10 °C to +50 °C;
- (i) minimum measured quantity; and
- (j) product limitations, if applicable.

[\*Nonretroactive as of January 1, 1995]

Amend paragraph T.2. by replacing contents and adding a new table T.2. to include reference to "liquefied compressed gases" in Accuracy Class 2.5. Cryogenic Meters as follows:

**T.2. Tolerances.** - The tolerances for mass flow meters for specific liquids, gases, and applications are listed in Table T.2.

Table T.2. Accuracy Classes for Mass Flow Meter Applications

Accuracy Class	Application or Commodity Being Measured	Acceptance Tolerance	Maintenance Tolerance
0.3	Loading rack meters, vehicle-tank meters, (excluding LP Gas) home heating oil, milk and other food products, large capacity motor-fuel dispensers (maximum discharge flow rates greater than 100 L or 25 gallon per minute), all other liquid applications not shown in the table where the minimum delivery is at least 700 kg (1500 lb)	0.2%	0.3%
0.5	Small capacity (retail) motor-fuel dispensers, agri-chemical liquids, all other liquid applications not shown in the table	0.3%	0.5%

Accuracy Class	Application or Commodity Being Measured	Acceptance Tolerance	Maintenance Tolerance
1.0	Anhydrous ammonia, LP Gas (including vehicle tank meters)	0.6%	1.0%
2.0	Compressed natural gas as a motor fuel	1.5%	2.0%
2.5	Cryogenic liquid meters, liquefied compressed gases other than LP Gas	1.5%	2.5%

Delete paragraph T.3. and renumber paragraphs T.4. and T.5. as T.3. and T.4., respectively.

Delete the subparagraphs (a) and (b) of the proposed paragraph T.3. and set the repeatability tolerances consistent with the repeatability tolerances in the other codes applicable to the devices listed in Table T.2. Replace the subparagraphs with new subparagraphs (a) and (b) to read:

~~T.4. T.3.~~ Repeatability. - When multiple tests are conducted at approximately the same flow rate, the range of the test results for the flow rate shall not exceed:

~~(a) 0.2 percent of the measured quantity for liquid measurement; and~~

~~(b) 0.6 percent of the measured quantity for vapor measurement.~~

(a) 0.2 percent for retail liquid motor fuel devices; and

(b) 40 percent of applicable tolerance for all other devices listed in Table 2.

The tolerance currently specified in paragraph T.5. for the type evaluation of liquid-measuring devices is 0.3 percent; tolerances in the proposed Table T.2. are as small as 0.2 percent. To avoid a conflict with the tolerances in the proposed Table T.2. and paragraph T.5., amend paragraph T.5. to read:

**T.5. Type Evaluation for Liquid-Measuring Devices.** - For type evaluation examinations, the tolerance values shall ~~be 0.3 percent. This tolerance shall apply under the following conditions:~~

(a) with any one liquid within the range of liquids

(b) at any one liquid temperature and pressure within the operating range of the meter, and

(c) at all flow rates within the range of flow rates.

**Discussion:** One of the main objections last July to changing the mass flow meters code from a tentative to a full code was that the 0.5 percent tolerance specified for mass flow meters in all applications would give the mass flow meters an unfair advantage over other types of meters used in the same application. The suitability of equipment table for liquid measuring devices would have eliminated this problem, but the table recommended by the S&T Committee was changed to an information item in 1993. In an effort to remove the criticism that the mass flow meters are given an unfair advantage due to the tolerance, it is proposed that the tolerances which currently apply to mass flow meters in other codes should be incorporated into the mass flow meters code. This table takes the tolerances for the suitability of equipment table and incorporates them into the code; the maximum division values have not been included since that is part of Item 310-4.

To identify if the correct meter has been installed in an application and to ensure that the correct tolerance is applied, the Committee recommends that the meter be marked with one of the accuracy classes designated in Table T.2. Since the manufacturer designates the tolerance to which the meter has been designed, the inspector will know which tolerance to apply. To be suitable for an application, the accuracy class must be equal to or of higher accuracy for the application listed in Table T.2. The tolerance corresponding to the accuracy class designated by the manufacturer shall be applied to the meter, regardless of the tolerance specified in Table T.2. for the application. Hence the manufacturer will have to explicitly declare the tolerance that the meter is expected to meet. In this way, the device user and the weights and measures official can expect the meter to perform within tolerance for at least the normal

## Specifications and Tolerances Committee

test interval for meters that may be used in the same application. The objective of this marking requirement is that chronic bad performance will be avoided and excessive maintenance will not be necessary to obtain meter performance with the specified tolerance limits.

Comments received at the Interim Meeting indicated general support for the approach of establishing meter classes. It was also noted that the NTETC Measuring Sector discussed and supported the use of a similar approach in defining criteria for suitability of equipment at its meeting in October 1993.

It should be noted that the tolerances for agri-chemical products are significantly less than that allowed in the Liquid-Measuring Devices Code. Over the years the Committee has received comments that the tolerances for agri-chemical liquids are too large, based upon the high cost of the products. If the proposed tolerances for agri-chemical liquids is controversial, the Committee will consider removing it from the table or using the existing tolerances to remove objections.

### 337-3 VC UR.3.3. Ticket Printer; Customer Ticket

(This item was adopted as part of the consent calendar.)

Source: Office of Weights and Measures

**Recommendation:** Add a new paragraph UR.3.3. and renumber current UR.3.3., UR.3.4., and UR.3.5. to apply to vehicle-mounted metering systems as follows:

*UR.3.3. Ticket Printer; Customer Ticket. - Vehicle-mounted metering systems shall be equipped with a ticket printer which shall be used for all sales where product is delivered through the meter. A copy of the ticket issued by the device shall be left with the customer at the time of delivery or as otherwise specified by the customer. [Nonretroactive and enforceable as of January 1, 1995. To become retroactive as of January 1, 1999.]*

**Discussion:** When the Mass Flow Meters Code is changed from a tentative to a permanent code, references to mass flow meters in the other codes will be deleted. The addition of paragraph UR.3.3. is proposed to make the Mass Flow Meters Code consistent with requirements for vehicle-mounted metering systems in the Vehicle-Tank Meters and LPG & Anhydrous Ammonia Liquid-Measuring Devices Codes. During review of this issue at the Interim Meeting, the Committee modified the recommendation to make the proposed language consistent with the proposed changes to the language in paragraph UR.2.2. of the Vehicle-Tank Meters Code (see Item 331-3).

### 337-4A V Tentative Status of the Code

(This item was adopted.)

Source: Carryover Item 337-5

**Recommendation:** Remove the tentative status of the code and make it a permanent code in Handbook 44.

If the NCWM votes to establish the Mass Flow Meters Code as a permanent code, all references to mass flow meters will be removed from the other Handbook 44 codes. Consequently, the Committee plans to editorially amend the application sections of other Handbook 44 Codes which currently reference mass flow meters to include the following:

A.X. This code does not apply to:

- (x) mass flow meters (see Sec. 3.37. Code for Mass Flow Meters)

**Discussion:** Numerous requirements were adopted last July to permit the code to apply to retail motor-fuel dispensers using mass flow meter technology, such as for compressed natural gas. Other added requirements have not been incorporated into the specific codes that now apply to mass flow meters. The recommendations in Items 337-2 and 337-3 aim to remove what are believed to be the last major objections to making the Mass Flow Meter code a full code in Handbook 44.

During the Interim Meeting, the S&T Committee noted objections that have been raised concerning the discrepancy between the tolerances specified in the tentative Mass Flow Meters Code and the tolerances specified in the LMD Code for devices used in the same application. Comments indicated that these concerns would be resolved if the tolerance structure were revised as described in Item 337-2.

### 337-4B      V      S.3.6. Automatic Density Correction

(This item was adopted.)

Based upon comments received, add the following as a new Item 337-4B to address volume-measuring devices used to measure compressed natural gas as an engine fuel.

**Recommendation:** To recognize volume-measuring devices being used to measure Compressed Natural Gas (CNG) as an engine fuel consistent with the requirements of the Hydrocarbon Gas Vapor-Measuring Devices Code and to permit time for these devices to be modified to incorporate automatic density correction, the Committee recommends that S.3.6. be amended to read:

#### S.3.6. ~~Mass Flow Meters~~ Automatic Density Correction.

- (a) An automatic means to determine and correct for changes in product density shall be incorporated in any mass flow metering system that is affected by changes in the density of the product being measured.
- (b) *Volume-measuring devices with automatic temperature compensation used to measure natural gas as a motor vehicle engine fuel shall be equipped with an automatic means to determine and correct for changes in product density, both for the temperature and composition of the product.*

*(Nonretroactive as of January 1, 1995. To become retroactive as of January 1, 1999.)*

**Discussion:** In the absence of a permanent Mass Flow Meters Code, requirements for mass flow meters have been adopted into several codes for measuring devices. The requirements of the Hydrocarbon Gas Vapor-Measuring Devices Code have been applied to devices used to measure CNG. This code permits volume measuring devices to indicate in units of volume, but the method of sale for CNG is currently being considered by the NCWM to be the gasoline gallon equivalent (GGE). The GGE is based upon mass units, hence, the automatic correction for changes in composition of the natural gas is needed to promote more accurate measurement.

To provide time to incorporate automatic density correction for these devices, subparagraph (b) is added as a nonretroactive requirement. During the time volumetric devices are used to measure compressed natural gas as a motor vehicle engine fuel, corrections for changes in product density due to changes in composition will have to be entered manually. It is the owner/user responsibility to maintain the device within tolerance at all times. Subparagraph (b) will become retroactive as of January 1, 1999.

## Taximeters Code

### 354-1 I UR.3.1. Units for Time, Distance Intervals, and Money Values

Source: Carryover S&T Item 354-1

**Recommendation:** The Committee has been asked to consider the addition of a paragraph to specify that taximeter rates be based on and programmed to increment in equal money values and at tenths of kilometers or miles as follows:

**UR.3.1. Units for Time, Distance Intervals, and Money Value.** The display of a taximeter shall be programmed to increment in uniform whole cent money values, at 0.1 kilometer (or 0.1 mile) intervals for distance, and at uniform time intervals. The uniform intervals for distance and time apply to both the initial and subsequent intervals.

The Committee is returning this issue to the regional associations for review and asks that the affected industry study this issue. Based upon discussions with industry, the regions must provide specific recommendations by November 1, 1994, to the S&T Committee, the Committee will omit this item from its 1995 agenda.

**Discussion:** Based on comments received during the Interim meeting, the Committee decided to change the title of the item and the proposed paragraph. The Committee hopes the revised title will help to emphasize that this paragraph does not establish the *value* of the rates which can be set on a meter; the paragraph only specifies that a meter must have equal *increment sizes* for the money value, distance interval, and time. This change applies to both the initial and subsequent intervals for distance and time, but the Committee recognizes that the initial money interval may differ from the subsequent money intervals.

The Committee also received comments that taxicab drivers are reluctant to handle pennies; therefore, they do not want fares which result in total amounts ending in other than five-cent increments. The recommended requirement specifies distance rates in 0.1 km or 0.1 mile intervals. If taxicab companies want to avoid fares requiring pennies, then the rates must be in integer multiples of \$0.05. Since Handbook 44 currently allows any distance to be used for taxicab rates, to increase rates a jurisdiction or taxicab company could change the distance increment without changing the monetary value of the rate. For example, the rate of \$.25 per 1/15 mile might be changed to \$.25 per 1/17 mile.

Language from the 1993 final S&T report is included below for reference as background material. No additional comments on this issue have been received by the Committee. Both the Western and Southern regional associations included this item on their agendas and both regions voted to adopt the language suggested above. At those meetings, comments indicated that value comparison by consumers is a concern as indicated by complaints received by specific weights and measures jurisdictions. It was also noted that specifying rate increments for taximeters is consistent with precedents in other codes, such as the Scales Code, where the permissible increments are limited to 1, 2, or 5; this paragraph makes no attempt to specify the monetary rate which can be charged.

#### *Background*

The Taximeter Code requires that rates be stated and conspicuously displayed in the cab, but does not provide for uniformity in units of distance. Modern electronic taximeters are capable of computing at a multitude of rates. Both the amount and distance of registration units can be changed without restriction. This has led to a proliferation of distance rates which are confusing to customers. Some examples of rates currently in use are listed below.

\$2.00 first 5/37 mile then \$.25 each 5/37 mile  
\$2.00 first 1/15 mile then \$.25 each 1/15 mile  
\$2.00 first 1/7 mile then \$.25 each 1/7 mile  
\$2.00 first 1/9 mile then \$.25 each 1/9 mile



The above rate schedules inhibit value comparison and are not "readily understandable by the ordinary passenger" as required by UR.3. Additionally, it can create difficulty in testing a meter on a measured-mile course because there may not be a change in the fare corresponding to tenths of a mile or to the 1-mile increment marked on most measured-mile courses. (See illustration below, which is based upon the first rate structure listed above. The top numbers represent distance in miles; the dollar amounts represent the fare amount corresponding to the distance.)

0	5/37	10/37	15/37	20/37	25/37	30/37	35/37	40/37
\$2.00	\$2.25	\$2.50	\$2.75	\$3.00	\$3.25	\$3.50	\$3.75	

↑  
1 mile

The Committee heard conflicting positions on this issue. In opposition to the information presented by the Western, some comments indicated that the proposed change to the units for rate increments will not help the consumer to make value comparisons. It was suggested that consumers do *not* make value comparisons among taximeter rates, hence requiring the information to be presented in only these units would not solve the raised concerns. In response to this statement, comments indicated that some weights and measures jurisdictions have received complaints from consumers who *do* make value comparisons and to whom the choice of which taxicab company to use is an economic decision. Comments also indicate that jurisdictions that use a measured-mile course for testing have experienced difficulty in testing meters programmed with unusual rates because the distances at which the fare changes does not correspond to a fixed increment.

It was argued that establishing fixed increments for rate changes was not within the domain of weights and measures jurisdictions since weights and measures jurisdictions do not typically establish taxi fares. This argument was raised in 1990 (Item 354-4) when paragraph S.2.1. Initial Time and Distance Intervals was adopted by the NCWM. In response to these comments, it was noted that the proposed requirement does not set the amount of the rate, simply the size of the money value division. It was further noted that precedence exists in other Handbook 44 codes where the maximum/minimum values of the units of measurement and money value have been established. For example, Scales Code Paragraphs S.1.8.1.M. and S.1.8.1., Money-Value Graduations specify the permissible value of the graduated intervals representing money-values on a computing scale.

### Grain Moisture Meters Code

#### 356-1 V S.1.2.2. Digital Indications and Recording Elements; Information Sent To Printer

(This item was adopted.)

**Source:** NTETC Grain Moisture Meter Sector

**Recommendation:** Modify paragraph S.1.2.2. (c) as follows:

- (c) *Meters shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type, grain moisture results, and calibration version identification.*

**Discussion:** At its last meeting, the Grain Sector noted that paragraph S.1.2.2. requires a meter to be equipped with a communication interface; however, there is no reference to the information that the meter should be able to communicate to the recording element. The Sector believes that language should be added to clarify the minimum

information intended to be communicated in such an interface. The S&T Committee emphasizes that this does not require the printer to be integral with the grain moisture meter; the printer may be an auxiliary printer or the printer for a computer may be interfaced to the grain moisture meter.

Based on comments received at the 1994 Interim Meeting, the S&T Committee made minor changes to the Grain Sector's proposal to make the language consistent with the language in Grain Moisture Meters Code paragraphs UR.3.4.(b).

### 356-2 V S.1.8. Level Indicating Means

(This item was adopted.)

Source: NTETC Grain Moisture Meter Sector

Recommendation: Modify paragraph S.1.8. as follows:

*S.1.8. Level Indicating Means. A meter shall be equipped with a level-indicating means level indicator and leveling adjustments if its performance is changed by an amount greater than the absolute value of the acceptance applicable tolerance when the meter is moved from a level position and zeroed in to a position that is out of level in any upright direction by up to 5 percent (approximately 3 degrees).*

*The level-indicating means shall be readable without removing any meter parts requiring a tool.  
[Nonretroactive as of January 1, 1989]*

**Discussion:** At its meeting last fall, the NTETC Grain Moisture Meter Sector suggested that means of making leveling adjustments to a moisture meter are needed for those meters required to have a level indicating means. However, the Sector reviewed the language at its March meeting and reversed itself by suggesting modified language to S.1.8. The S&T Committee reviewed the proposed language and, with the exception of deleting the requirement for leveling adjustments, accepted the language of the Sector, which appears in its recommendation.

The S&T Committee believes that if a grain moisture meter requires a level indicating means, then the meter should also be equipped with a means to level the meter. The Committee believes that a requirement for a leveling adjustment should be a design requirement for the meter to ensure that appropriate means are consistently provided with the device.

The Committee is receptive to reducing the out-of-level limit that is specified for grain moisture meters if the Sector believes that a smaller value is appropriate and justified. The Committee asks the Sector to evaluate the issue and suggest possible changes to the limit for an out-of-level condition, assess the effect of out-of-level conditions on the accuracy of grain moisture meters, and provide justification for any recommendation it may provide regarding the leveling means and the limit for out-of-level performance.

### 356-3 W S.1.10. Operating Temperature; Allowance of 5 °C for Type Evaluation

(This item was withdrawn.)

Source: NTETC Grain Moisture Meter Sector

**Discussion:** The NTETC Grain Moisture Meter Sector asked the S&T Committee to consider adding a note to paragraph S.1.10 to clarify how testing should be performed to determine compliance with operating temperature requirements. Based on additional comments received at the Interim Meeting and further review of the issue, the Committee agreed that the procedure pertains to type evaluation testing, not routine field enforcement, and is more appropriately addressed in NCWM Publication 14. Consequently, the Committee has withdrawn the item.

**356-4 V S.2.4. Determination of the Sample Quantity; Use of External Equipment with Grain Moisture Meters**

(This item was adopted.)

**Source:** Central Weights and Measures Association

**Recommendation:** Add the following paragraph to the Grain Moisture Meter Code:

*S.2.4. Determination of Quantity and Temperature. - The moisture meter system shall not require the operator to judge the precise volume or weight and temperature needed to make an accurate moisture determination. External grinding, weighing, and temperature measurement operations are not permitted.*

*[Nonretroactive as of January 1, 1998. To become retroactive as of January 1, 2003.]*

**Discussion:** In July 1993, the NCWM adopted a number of changes to the Grain Moisture Meters Code which were proposed by the NTETC Grain Sector. The objective of many of these changes was to phase out meters requiring operator manipulation in favor of instruments that make the grain moisture measurements automatically, thus eliminating many operator-dependent variables.

In the 1993 final report of the S&T Committee, it was also noted that NTEP will accept for type evaluation only those devices for which the moisture measurement process and the presentation of the moisture value is automatic (some operator actions would still be needed). These requirements were adopted as a step towards the ultimate goal of automating grain moisture measurements (that is, without operator involvement in the measurement process).

The Grain Moisture Meter Sector and the NCWM recognized that operator-dependent processes in the moisture determination can facilitate inadvertent, as well as intentional, fraud. While the intent of the NTETC Grain Sector and the NCWM is to automate the process more fully, questions have been raised as to whether or not the language adopted in July 1993 actually achieves this goal, particularly as related to the weighing and temperature measurement of the grain sample.

It is acknowledged that some operator action will be needed on the new generation of meters. However, the extent to which the operator is involved in the moisture determination has been questioned. For example, it is anticipated that the operator must pour the grain sample into the meter; however, questions have been raised as to whether or not any preparation of the grain samples, such as weighing or grinding (both of which can introduce potential errors into the process), should be permitted. Grinding is not considered acceptable because the process can affect the moisture content of the sample. This requirement means that the operator shall add a sufficient amount of grain to the moisture meter to permit the measurement to be made; however, the design shall not require the operator to measure a precise amount of grain.

In its discussion of this issue at the Interim Meeting, the S&T Committee recognized that the intent of the NCWM is to phase out meters which introduce operator-dependent variables into the moisture determination process as part of improving accuracy of the commercial grain measurement system.

**356-5 V S.5.3. Calibration Transfer**

(This item was adopted.)

**Source:** NTETC Grain Moisture Meter Sector

**Recommendation:** Add a new paragraph S.5.3. as follows:

**S.5.3. Calibration Transfer.** - The instrument hardware/software design and calibration procedures shall permit calibration development and the mathematical transfer of calibrations between instruments of like models.

**Note:** Only the manufacturer or the manufacturer's designated service agency may make calibration transfer adjustments on moisture meters and, except for instrument failure and repair, only at a prescribed period of time during the year. This does not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instructions of the manufacturer or his designated service agency.

**Discussion:** At its last meeting, the NTETC Grain Moisture Meter Sector recognized that language is needed to specify that calibration transfer be possible. An identical requirement is included in the proposed Near Infrared Protein Analyzers Code.

## 356-6 I UR.3.4. Printed Tickets

**Source:** Central Weights and Measures Association

**Discussion:** The following proposal was submitted to the Central Weights and Measures Association for consideration. The Central reported that the proposal received mixed comments. Some supported the item as proposed; others felt that a printed ticket should be provided as a deterrent to fraud; others indicated that the capability to add a printer should be required; however, the printer itself should not be mandatory.

The proposal was to delete part (b) of paragraph UR.3.4. as follows:

### UR.3.4. Printed Tickets.

- (a) Printed tickets shall be free from any previous indication of moisture content or type of grain or seed selected.

~~(b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, and calibration version identification. The ticket shall be generated by the grain moisture meter system. [Nonretroactive and effective as of January 1, 1998. To become retroactive as of January 1, 2003.]~~

In July 1993 the NCWM voted to require that a customer be given a printed ticket which is generated by the grain measurement system (not necessarily by the meter itself). This requirement was added to recognize that conditions during a typical grain moisture transaction, although of significant financial concern to the customer, do not usually enable the customer to observe the moisture measurement process. Moreover, this requirement was added to reduce the errors that may occur in transcribing displayed information to a written record and to ensure that the customer always receives written verification of the transaction information with some means to tie it to the customer's specific transaction.

The proposal suggested deleting the portion of paragraph UR.3.4. stipulating that the customer receive a ticket, noting that for most grain moisture measuring devices the operator currently writes the moisture results legibly on the ticket. Concern was expressed that supplying a ticket printer will unnecessarily increase the cost of a grain moisture meter. It was also noted that existing equipment evaluated by NTEP will need to be altered in the field. Since the information to be printed on the ticket has not been specified in the code, a ticket printer is not needed.

In reviewing this issue at the Interim Meeting, Committee members noted that many farmers want a printed receipt to verify the specifics of the transaction, particularly the moisture indicated by the metering system and the type of grain. The Committee agreed that it is not always practical or possible for customers to observe the information displayed by the grain moisture meter for their transaction. The Committee also noted that the printer does not have to be an integral part of the moisture meter; the information only has to be provided by a printer in the grain moisture measuring system. It was also noted that equipment currently in the field has not been evaluated by NTEP and will not be. Only equipment meeting the new requirements will be accepted for evaluation by NTEP.

The Committee maintains the position that the system should print the information; the information should not be handwritten or printed with a device separate from the grain moisture measuring system. The Committee has not received sufficient justification to warrant reversing the decision made by the NCWM in 1993. The Committee is



maintaining this informational item to allow for additional information to be submitted; however, the item will be withdrawn from the Committee's 1995 agenda unless additional information is provided to support making changes to this paragraph.

## Other Items

### 360-1 I Volume Measuring Machines for Shipping Charges

**Source:** Carryover Item 360-1

**Discussion:** Different equipment technologies are used to measure the volume of unpackaged objects and containers to determine shipping charges. The designs are quickly becoming established for these machines, the use of which is rapidly increasing. These systems often incorporate scales. Presentations on these devices were given by Quantronix, Inc. at the 1992 Interim Meetings and by Toledo Scale at meetings of the Western and the Southern Weights and Measures Associations.

At the 1993 Interim Meeting, the Executive Committee approved the formation of a working group to address the development of a code, routine field test procedures, type evaluation criteria, and type evaluation test procedures for these devices. The work group met in June 1993, October 1993, and January 1994. At its January 1994 meeting, the work group agreed to change its name to "Multiple Dimension Measuring Devices" to more accurately reflect the scope of its activities.

Significant progress has been made in the development of proposed requirements for these devices. The work group has based its work on a draft document prepared by the Canadian Legal Metrology Branch, comments provided to the S&T Committee by Toledo Scale and Weigh-Tronix, and existing Handbook 44 requirements for related equipment. The work group plans to recommend that the NCWM consider adopting these requirements in the form of a separate Handbook 44 code; the group anticipates that the code will be ready to submit to the S&T Committee by November 1994 for possible consideration by the NCWM in 1995.

The work group held its fourth meeting Columbus, OH in April 1994, and will hold its next meeting in San Jose, CA in August 1994. Companies and individuals interested in participating in this work group or in receiving copies of the meeting summaries should contact OWM.

### 360-2A V Proposed Code for Near Infrared Grain Analyzers

(This item was adopted.)

**Source:** NCWM National Type Evaluation Technical Committee (NTETC) Near Infrared Protein Analyzer Sector

**Discussion:** In 1991 the NCWM established two sectors to the National Type Evaluation Technical Committee to address grain measuring equipment: the Grain Moisture Meter Sector and the Near Infrared Protein Analyzer Sector. The efforts of these sectors were initially concentrated in identifying proposed changes to the Grain Moisture Meters Code and developing type evaluation test procedures; the proposed criteria developed in this area were adopted by the NCWM at its July 1993 meeting. The sector members have now focused their attention in establishing criteria and test procedures code for near infrared grain analyzers; the proposed code for near infrared grain analyzers is the product of this effort.

Based on comments received at the Interim Meeting, the S&T Committee made minor modifications to the proposed code in the following areas: (1) The reference to "customer indication" was deleted in paragraphs S.1.1. (c) and UR.2.3.(b). (2) The headings in Table 1 were modified.

**Recommendation:** Incorporate the following as a tentative code into Handbook 44 to address Near Infrared Grain Analyzers. Note that the specifications are nonretroactive and effective as of January 1, 2000, and to become retroactive as of January 1, 2005.



### **Tentative Code – Near-Infrared Grain Analyzers**

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 for Near Infrared Grain Analyzers.

#### **A. Application**

**A.1.** - This code applies to near-infrared (NIR) grain analyzers; that is, devices used to indicate the constituent values (other than moisture content) of grain using near-infrared reflectance or transmittance technology. These instruments may analyze either whole grain or ground grain samples. The code consists of general requirements applicable to all NIR analyzers and specific requirements applicable only to certain types of NIR analyzers, grain types, or grain constituents.

**A.2.** - This code does not apply to devices used for in-motion measurement of grain constituent values.

**A.3. Type Evaluation.** - The National Type Evaluation Program will accept for type evaluation only those devices that comply with the nonretroactive requirements scheduled to take effect on January 1, 2000. State enforcement will be based upon the effective dates identified with each requirement when specific dates are shown.

**A.4.** - See also Sec. 1.10; General code requirements.

#### **S. Specifications**

##### **S.1. Design of Indicating, Recording, and Measuring Elements.**

###### **S.1.1. Digital Indications and Recording Elements.**

- (a) Analyzers shall be equipped with a digital indicating element.
- (b) The minimum height for the digits used to display constituent values shall be 10 mm.
- (c) Analyzers shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type or class, constituent values, and calibration version identification.
- (d) A digital indicating element shall not display, and a recording element shall not record, any constituent value before the end of the measurement cycle.
- (e) Wheat protein content shall be recorded and displayed as percent protein reported on a constant moisture basis of 12 percent wet basis.
- (f) An analyzer shall not display or record any constituent value that is beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation).

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.1.2. Selecting Grain Class and Constituent.** - Provision shall be made for selecting, displaying, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, etc. or PROT, etc.) A symbol to identify the display of the type or class of grain and constituent(s) selected is permitted provided that it is clearly defined adjacent to the display. Meters shall be capable of indicating the grain type using a minimum of four characters. Minimum acceptable abbreviations are listed in Table S.1.2.

*[Nonretroactive and effective as of January 1, 2000. To become retroactive January 1, 2005.]*

Add a new Table S.1.2. as follows:

<b>Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations</b>	
<b>Grain Type</b>	<b>Minimum Acceptable Abbreviation</b>
<i>Durum Wheat</i>	<i>DURW</i>
<i>Hard Red Spring Wheat</i>	<i>HRSW</i>
<i>Hard Red Winter Wheat</i>	<i>HRWW</i>
<i>Hard White Wheat</i>	<i>HDWW</i>
<i>Soft Red Winter Wheat</i>	<i>SRWW</i>
<i>Soft White Wheat</i>	<i>SWW</i>

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.1.3. Operating Range.** - An analyzer shall automatically and clearly indicate when the operating range of the device has been exceeded. The statement of the operating range shall be specified in the operator's manual and shall operate as follows:

- The ambient temperature range over which the analyzer may be used and still comply with the applicable requirements shall be specified. The minimum temperature range shall be 10 to 30 °C. No constituent value may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the analyzer is outside its specified operating range.
- The constituent range shall be specified for each grain or seed for which the analyzer is to be used. A constituent value may be displayed when the constituent range is exceeded if accompanied by a clear indication that the constituent range has been exceeded.
- For whole grain analyzers only, the temperature range shall be specified for each grain or seed for which an analyzer is to be used. The minimum temperature range for each grain shall be 10 to 30 °C. No constituent value may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the grain sample exceeds the temperature range for the grain. The requirements of this subsection (c) are not applicable to ground grain analyzers.
- For whole grain analyzers, the maximum allowable difference in temperature between the instrument environment (ambient temperature) and the sample for which an accurate constituent determination can be made shall be specified. The minimum temperature range shall cover at least 10 °C. No constituent value may be displayed when the maximum allowable temperature difference is exceeded. An appropriate error message shall be displayed when the difference between the ambient temperature and the sample temperature exceeds the specified difference. The requirements of this subsection (d) are not applicable to ground grain analyzers.

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.1.4. Operating Temperature**

- An analyzer shall not display or record any usable values until the internal operating temperature necessary to meet tolerance requirements has been attained, or the analyzer shall bear a conspicuous statement adjacent to the indication stating that the analyzer shall be turned on for a time period specified by the manufacturer prior to use.

- (b) *If an instrument does not meet tolerance requirements because there is an upper internal operating temperature limit that could be exceeded when operating within the ambient temperature range specified by the manufacturer, then a means of sensing and indicating an over-temperature condition must be provided.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.1.5. Design of Measuring Elements.** - *The display shall permit constituent value determination to both 0.01 percent and 0.1 percent resolution. The 0.1 percent resolution is for commercial transactions; the 0.01 percent resolution is for calibration purposes only, not for commercial purposes.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

## **S.2. Design of NIR Analyzers**

**S.2.1. Minimum Sample Size.** - *Analyzers shall be designed to measure constituent values of representative size grain samples. The minimum allowable sample size used in analysis shall be 20 g.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

### **S.2.2. Electric Power Supply.**

**S.2.2.1. Power Supply, Voltage and Frequency.** - *An analyzer that operates using alternating current must perform within tolerance requirements over the line voltage range 100-130 volts and over the frequency range of 59.5 to 60.5 Hz.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.2.2.2. Power Interruption.** - *A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.2.3. Level Indicating Means.** - *Analyzers shall be equipped with a level indicator and leveling adjustments if its performance is changed by an amount greater than the tolerance requirement when the instrument is moved from a level position into a position that is out of level in any upright direction by up to 5 percent (approximately 3 degrees). The level-indicating means shall be readable without removing any instrument parts requiring a tool.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.2.4. Environmental Conditions.** - *Instrument optics and electronics must be protected from exposure to dust by either sealing these areas or by protecting them with a dust filtration system suitable for the removal of air-borne grain dust.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

### **S.2.5. Calibration Transfer and Verification.**

**S.2.5.1. Calibration Transfer.** - *The instrument hardware/software design, and calibration procedures shall permit calibration development and the mathematical transfer of calibrations between instruments of like models.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.2.5.2. Calibration Version.** - *An instrument must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make constituent determinations.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**S.2.5.3. Calibration Corruption.** - If calibration constants are digitally stored in an electronically alterable form, the analyzer shall be designed to make automatic checks to detect corruption of calibration constants. An error message must be displayed if calibration constants have been electronically altered. [Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]

**S.2.6. Provision for Sealing.** -

- a. Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.
- b. If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and 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 (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants).

A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) 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 and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]

**S.3. Accessory Equipment.** When the operating instructions for a NIR analyzer require accessory equipment separate from and external to the analyzer, such equipment shall be appropriate and complete for the measurement. [Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]

**S.3.1. Grinders.** - The make and model of grinder used for ground grain NIR analyzers must be specified by the manufacturer and required as auxiliary equipment in the determination of constituent values for applicable grain types.

[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]

**S.4. Operating Instructions and Use Limitations.** - The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a constituent value. Operating instructions shall include the following information:

- a. name and address or trademark of the manufacturer;
- b. the type or design of the device for which the operating instructions are intended to be used;
- c. date of issue;
- d. the kind or classes of grain or seed for which the device is designed to measure constituent values; and
- e. the limitations of use, including but not limited to constituent range, grain or seed temperature, kind or class of grain or seed, instrument temperature, voltage and frequency ranges, electromagnetic interferences, and necessary accessory equipment.

[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]

## N. Notes

### N.1. Testing Procedures.

**N.1.1. Field Inspection.** - Whole grain samples shall be used as the official field inspection standards. Five samples per grain type or class shall be used to check instrument performance. Each sample will be analyzed once. One of the samples will be analyzed an additional four times to test instrument repeatability. For ground grain instruments, the ground sample will be repacked four times. A new grind is not required.

Wheat protein values shall be assigned to test samples by the Federal Grain Inspection Service (FGIS). Tolerances shall be applied to individual sample measurements, the average of individual measurements on each of the five test samples, and the maximum difference (range) in results for five analyses on one of the test samples.

**N.1.2. Standard Reference Samples, Wheat.** - Reference samples used for field inspection purposes shall be clean and selected to reasonably represent the constituent range. These samples shall be selected such that the difference between wheat protein values obtained using the FGIS standard reference method and an official FGIS NIR wheat protein analyzer does not exceed 0.3 for individual test samples or 0.15 for the average of 5 samples.

## T. Tolerances

**T.1. To Underregistration and to Overregistration.** - The tolerances hereinafter prescribed shall be applied to errors of under registration and errors of overregistration.

**T.2. Tolerance Values.** - Acceptance and maintenance tolerances shall be equal. Tolerances for individual samples and the average for five samples are shown below:

Type of Grain	Acceptance and Maintenance Tolerances for NIR Wheat Protein Analyzers		
	Individual Samples	Average for Five Samples	Range for Five Retests
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	0.60%	0.40%	0.40%

## UR. User Requirements

### UR.1. Installation Requirements.

The NIR analyzer shall be installed in an environment within the range of temperature and/or other environmental factors specified in the operating manual.

### UR.2. User Requirements.

**UR.2.1. Operating Instructions.** - The operating instructions for the NIR analyzer shall be readily available to the user, service technician, and weights and measures official at the place of installation. It shall include a list of accessory equipment if any are required to obtain constituent values, and the type or class of grain to be measured with the NIR analyzer.

**UR.2.2. Other Devices not used for Commercial Measurement.** - If there are other NIR analyzers on the premises not used for trade or determining other charges for services, these devices shall be clearly and conspicuously marked "Not for Use in Trade or Commerce."



**UR.2.3. Printed Tickets. -**

- (a) *Printed tickets shall be free from any previous indication of constituent or grain type selected. The printed ticket shall indicate constituent values reported on a constant moisture basis.*
- (b) *The customer shall be given a printed ticket showing the date, grain type or class, constituent results, and calibration version identification. The ticket shall be generated by the near-infrared grain analyzer system.*

*[Nonretroactive and effective as of January 1, 2000. To become retroactive as of January 1, 2005.]*

**UR.2.4. Grinders. -** Place grinders in a separate room from the NIR analyzer to avoid instrument contamination. If a separate room is not available, the grinder may be in the same room with the NIR analyzer provided the grinder is not placed within 1 meter of the air intake on the NIR.

**UR.2.5. Sampling. -** Samples shall be obtained by following appropriate sampling methods and equipment. These include, but are not limited to grain probes of appropriate length used at random locations in the bulk, the use of a pelican sampler, or other techniques and equipment giving equivalent results. The sample shall be taken such that it is representative of the lot.

**UR.2.6. Level Condition. -** If equipped with a level indicator, an analyzer shall be maintained in a level condition.

**UR.2.7. Operating Limitation. -** Constituent determinations shall not be made when the difference in temperatures between the grain sample and the instrument environment (ambient temperature) exceeds manufacturer recommendations.

**UR.2.8. Slope and Bias Adjustments. -** A written explanation and record of bias and slope changes shall be maintained. The log shall indicate the date and magnitude of changes in bias and slope constants and shall show that these changes were made to bring the instrument into closer agreement with the reference method.

**360-2B      V      NIR Grain Analyzers; Nonretroactive and Retroactive Dates**

(This item failed.)

Source: This item was added as a new item during the July 1994 annual meeting of the NCWM.

**Language for Vote:** The Committee has listened to the requests to delete the nonretroactive and retroactive dates contained in Near Infrared Grain Analyzers Code. Without taking a position on whether to retain or delete the dates, the Committee is willing to allow the Conference to vote on whether or not to retain the dates in the NIR Grain Analyzers Code. The Committee provides the following changes for a vote:

**Delete all nonretroactive and retroactive dates in the Near Infrared Grain Analyzers Code.**

Amend A.3. to read:

**A.3. Type Evaluation.-** The National Type Evaluation Program will accept for type evaluation devices designed to comply with this code.

**Discussion:** There have been questions as to why this tentative code contains nonretroactive and retroactive dates. The nonretroactive dates are included in the code for the same reasons that they are used in other codes, namely, NIR grain analyzers which will fall under this code when it becomes effective, are already in use. Nonretroactive dates are included to recognize devices that were manufactured and installed (consistent with G-A.6.) and to allow those devices to continue to be used without modification until the requirements become retroactive.

The nonretroactive dates are also included to inform manufacturers and users of NIR grain analyzers that they either manufacture or own, of the time schedule with which the equipment must comply. This information is necessary for informed decisions regarding the implementation dates for code requirements. Since the NTEP evaluation of these meters will take time and involve an on-going calibration program, it is reasonable that only those devices that meet the nonretroactive requirements be accepted for type evaluation. In this way, purchasers of NIR grain analyzers will have some assurance that the devices they purchase will continue to be acceptable when new design requirements become retroactive.

The retroactive dates are included to inform device owners of when they must update their equipment to meet the new requirements and be interfaced with the on-going calibration program. The retroactive requirements establish a deadline by which the calibrations in all NIR grain analyzers used commercially are to be updated to the national calibration program. This is consistent with the wishes of Congress expressed in the 1990 Farm Bill to improve the accuracy of grain measurement and more closely align NIR grain analyzers used for wheat protein analysis with the official USDA FGIS system. Since NIR grain analyzers are heavily software driven, the most critical aspect of updating these devices is to update their software-based calibrations.

The Committee provides this item for a vote to respond to the apparent wishes of the voting members of the NCWM. The Committee is not recommending a position on this item, but presents it for a vote to permit the Conference to establish its position on the nonretroactive and retroactive dates.

### 360-3 I OIML Report

The following information was provided by Mr. O. K. Warnlof, Standards Management Program, NIST, on OIML activities of significant importance to the NCWM.

The reorganization of the work program of OIML into Technical Committees (TC) and Subcommittees (SC), the International Recommendations (R) published, and their respective work projects (p) is listed below. If anyone is not a member of a U.S. National Working Group and wishes to participate in the work or desires information concerning the status of any of the work projects listed, please contact me at (301) 975-4026.

STRUCTURE OF TECHNICAL COMMITTEE (TC) 8 "INSTRUMENTS FOR MEASURING QUANTITIES OF FLUIDS" (responsibility Switzerland)		
SC1	Static volume measurement	France
SC2	Static mass measurement	Australia
SC3	Dynamic volume measurement (liquids other than water)	Germany
SC4	Dynamic mass measurement (liquids other than water)	USA
SC5	Water meters	United Kingdom
SC6	Measurement of cryogenic	USA
SC7	Gas metering	Belgium
SC8	Gas meters	Netherlands

**Responsibility for reviewing existing Recommendations (R) and Documents (D) and for developing projects (p)**

TC8	INSTRUMENTS FOR MEASURING QUANTITIES OF FLUIDS
R4	Volumetric flasks (one mark) in glass
R22	International alcoholometric tables
R29	Capacity serving measures
R40	Standard graduated pipettes for verification officers
R41	Standard burettes for verification officers

<b>TC8</b>	<b>INSTRUMENTS FOR MEASURING QUANTITIES OF FLUIDS</b>	
R43	Standard graduated glass flasks for verification officers	
R45	Casks and barrels	
R63	Petroleum measurement tables	
R96	Measuring container bottles	
	p1	Laboratory volume measures: Automatic pipettes
	p2	Measurement and calculation of compressibility factors of gases
	p3	Methods and devices for verification of measuring instruments for quantities of liquids: standard capacity measures
	p4	Methods and devices for verification of measuring instruments for quantities of liquids: pipe provers
	p5	Revision of R63

<b>SC1:</b>	<b>Static volume measurement</b>	
R71	Fixed storage tanks. General requirements	
R80	Road and rail tankers	
R85	Automatic level gauges for measuring the level of liquid in fixed storage tanks	
R95	Ships' tanks- General requirements	
	p1	Revision of R85
	p2	Installations for gauging road and rail tankers

<b>SC2:</b>	<b>Static mass measurement</b>	
	p1	Static direct mass measurement of quantities of liquid

<b>SC3:</b>	<b>Dynamic volume measurement (liquids other than water)</b>	
R5	Meters for liquids other than water with measuring chambers	
R27	Volume meters for liquids (other than water). Ancillary equipment	
R57	Measuring assemblies for liquids other than water fitted with volume meters. General provisions	
R67	Measuring assemblies for liquids other than water fitted with volume meters. Provisions specific to particular assemblies	
R86	Drum meters for alcohol and their supplementary devices	
	p1	Revision of R5, R27, R57, R67, and R77
	p2	Revision of R86
	p3	Testing procedures for pattern examination of fuel dispensers for motor vehicles

<b>SC4:</b>	<b>Dynamic mass measurement</b>	
R105	Direct mass flow measuring systems for quantities of liquids	
	p1	Revision of R105

<b>SC5:</b>	<b>Water meters</b>	
R49	Water meters (intended for the metering of cold water)	
R72	Hot water meters	
D4	Installation and storage conditions for cold water meters	

<b>SC5:</b>	<b>Water meters</b>	
D7	The evaluation of flow standards and facilities used for testing water meters	
	p1	Revision of R49 and R72

<b>SC6:</b>	<b>Measurement of cryogenic liquids</b>	
R81	Measuring devices and measuring systems for cryogenic liquids (including tables of density for liquid argon, helium, hydrogen, nitrogen and oxygen)	
	p1	Revision of R81

<b>SC7:</b>	<b>Gas metering</b>	
	p1	Measurement of quantities of gas distributed by pipeline
	p2	Gas calorimetry

<b>SC8:</b>	<b>Gas meters</b>	
R6	General provisions for gas volume meters	
R31	Diaphragm gas meters	
R32	Rotary piston gas meters and turbine gas meters	
	p1	Correctors of gas volumes
	p2	Vortex meters
	p3	Revision of R6
	p4	Revision of R31
	p4	Revision of R32

Note: "Revision" includes compilation and/or completion in view of application to the OIML Certificate System, etc.

<b>STRUCTURE OF TECHNICAL COMMITTEE (TC) 9</b> <b>"INSTRUMENTS FOR MEASURING MASS AND DENSITY"</b> (responsibility U.S.)		
SC1	Nonautomatic weighing instruments	Germany & France
SC2	Automatic weighing instruments	U.K.
SC3	Weights	U.S.
SC4	Densities	Vacant

**Responsibility for reviewing existing Recommendations (R) and Documents (D) and for developing projects (p)**

<b>TC9</b>	<b>INSTRUMENTS FOR MEASURING MASS AND DENSITY</b>	
R60	Metrological regulation for load cells	
R74	Electronic weighing instruments	
	p1	Revision of R 60

<b>SC1</b>	<b>Nonautomatic weighing instruments</b>	
R76	Nonautomatic weighing instruments	

<b>SC2</b>	<b>Automatic weighing instruments</b>	
R50	Continuous totalizing automatic weighing instruments (belt weighers)	
R51	Checkweighing and weight grading machines	
R61	Automatic gravimetric filling machines	
R106	Automatic rail weighbridges	
R107	Discontinuous totalizing automatic weighing instruments (hopper weighers)	
	p1	Revision of R 50
	p2	Revision of R 51
	p3	Revision of R 61
	p4	Revision of R 106
	p5	Revision of R 107

<b>SC3</b>	<b>Weights</b>	
R1	Cylindrical weights from 1 gram to 10 kilograms of medium accuracy class	
R2	Rectangular bar weights from 5 kilograms to 50 kilograms of medium accuracy class	
R20	Weights of accuracy classes E <sub>1</sub> , E <sub>2</sub> , F <sub>1</sub> , F <sub>2</sub> , & M <sub>1</sub> , from 1 mg to 50 kg	
R25	Standard weights for verification officers	
R33	Conventional value of the result of weighing in air	
R47	Standard weights for testing of high capacity weighing machines	
R52	Hexagonal weights, ordinary accuracy class, from 100 g to 50 kg	
	p1	Weights of Classes E <sub>1</sub> , E <sub>2</sub> , F <sub>1</sub> , F <sub>2</sub> , M <sub>1</sub> , M <sub>2</sub> , & M <sub>3</sub> (consolidation of R 1, 2, 20, & 25)

<b>SC4</b>	<b>Densities</b>	
R22	International alcoholometric tables	
R44	Alcoholometers and alcohol hydrometers and thermometers for use in alcoholometry	
	p1	Density values of aqueous sucrose solutions
	p2	Revision of R 22

Jack Y. Jeffries, Florida, Chairman

R. Kelley, New York City, NY

R. Murdock, North Carolina

R. Suiter, Nebraska

G. West, New Mexico

R. Marceau, Canada, Technical Advisor

T. Butcher, NIST, Technical Advisor

H. Oppermann, NIST, Technical Advisor

## Committee on Specifications and Tolerances



## Final Report of the Committee on Education, Administration, and Consumer Affairs

James D. Harnett, Chairman  
Sealer of Weights and Measures  
Orange County, California

Reference  
Key Number

### 400 Introduction

This is the Final Report of the Committee on Education, Administration, and Consumer Affairs for the 79th Annual Meeting of the National Conference on Weights and Measures. The Report consists of the Interim Report offered in the Conference "Program and Committee Reports" as amended by the Addendum Sheets issued during the Annual Meeting.

Included in the report are recommendations for changes in the name, scope, and mission of the Committee. The Executive Committee has identified public outreach and administrative excellence as priorities for the NCWM as it moves into the next century; consequently, the Committee on Education, Administration, and Consumer Affairs plans to change its organization and method of operation to allow it more time to focus on these important areas (see Appendix J and Items 402-9 and 404). The Committee's role will be to provide leadership in the development of uniform, quality weights and measures services in the areas of effective program management, education, and public relations; however, its success will depend on the implementation of its recommendations by members of the Conference.

Table A identifies all of the items contained in the Report by Reference Key Number, Item Title, and Page Number. Voting items are marked with a "V" after the item number. Consent calendar items are marked with a "VC." Items marked with an "I" after the reference key number are information items. The items marked with a "W" have been withdrawn.

Table B lists the appendices to the report, and Table C provides a summary of the results of the voting on the Committee's items and the report in entirety.

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**Table A**  
**Index to Reference Key Items**

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Reference Key No.		Title of Item	Page
401	I	Regional Weights and Measures Activities . . . . .	352
402		National Training Program (NTP) . . . . .	353
402-1	I	NTP Status Report . . . . .	353
402-2	I	Regional Training Activities . . . . .	355
402-3	I	NTP Survey . . . . .	355
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402-5	I	Revision of Retail Computing Scales Module . . . . .	356
402-6	V	Redesign of the NTP's Training on Scales . . . . .	359
402-7	V	Awarding of Additional CEU's for Completion of Revised Modules . . . . .	359

Table A (Continued)

Reference Key No.		Title of Item	Page
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402-9	I	Weights and Measures Administration Module . . . . .	361
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402-11	VC	Participation by Other Countries in the NTP Certification Program . . . . .	362
402-12	VC	NTP Record Keeping Requirements . . . . .	362
402-13	W	Expansion of NTP Registry . . . . .	363
<b>403</b>		<b>Administration . . . . .</b>	<b>363</b>
403-1	I	Enforcement Actions . . . . .	363
<b>404</b>	<b>I</b>	<b>Consumer Affairs . . . . .</b>	<b>363</b>
<b>405</b>	<b>I</b>	<b>Safety . . . . .</b>	<b>364</b>

Table B  
Appendices

Appendix	Title	Reference Key No.	Page
A.	NTP Certification Summary	402-1 . . . . .	366
B.	NTP Registry Summary of Activity	402-1 . . . . .	369
C.	Summary of the Results of the NTP Survey of State Weights and Measures Directors	402-3 . . . . .	378
D.	Proposal to Restructure the NTP's Training on Scales	402-6 . . . . .	393
E.	Letter from IACET on the Awarding of Additional CEU's	402-7 . . . . .	394
F.	Request for Resources to Complete and Maintain Module 23, Part II	402-9 . . . . .	396
G.	Proposed Changes to the NCWM Uniform Administrative Procedures for Certification of Weights and Measures Officials	402-11 . . . . .	399
H.	Correspondence on Safety Issues	405 . . . . .	402
I.	Draft of Proposals to L&R and S&T Committees Concerning Enforcement Actions	403-1 . . . . .	411
J.	Report on the Special Meeting of the NCWM Committee on Education, Administration, and Consumer Affairs	404 . . . . .	414

**Table C**  
**Voting Results**

Reference Key No.	House of State Representatives		House of Delegates		Results
	Yes	No	Yes	No	
402 (Consent Calendar)	49	0	62	0	Passed
402-6	47	0	64	0	Passed
402-7	46	0	66	0	Passed
402 (in entirety)	45	0	67	0	Passed

**Details of All Items**  
(in order of Reference Key Number)

**401            I            Regional Weights and Measures Activities**

The Committee reviewed and discussed the following:

1. The final report of the Education, Administration, and Consumer Affairs Committee to the 36th Annual Technical Conference of the Western Weights and Measures Association (September 1993).
2. The final report of the Education, Administration, and Consumer Affairs Committee to the 48th Annual Conference of the Southern Weights and Measures Association (October 1993).
3. The final report of the Education Committee to the Central Weights and Measures Association (CWMA Interim Meeting, September 1993).
4. The final report of the Committee on Education, Administration, and Consumer Affairs to the Central Weights and Measures Association (April 1994).
5. The final report of the Committee on Education, Administration, and Consumer Affairs to the 21st Annual Conference of the Northeastern Weights and Measures Association (May 1994).

The positions that the various regional groups have taken on specific items in this report are noted as part of the discussion of the items. The Committee would like to thank all of the regional associations for their inputs.

## 402 National Training Program (NTP)

### 402-1 I NTP Status Report

The status of the funds remaining under the second grant provided by the National Institute of Standards and Technology (NIST) to the NCWM for the development of training materials for weights and measures officials is as follows (as of June 30, 1994):

Net outlays to date:	\$ 83,858.22
Total unliquidated obligations:	—
(money committed to contractors)	
Total outlays & unliquidated obligations:	83,858.22
Total grant funds authorized:	180,000.00
Unobligated balance of funds:	96,141.78
(money available for future module development)	

The first grant (totaling \$515,189) was closed out in 1992. The current status of work accomplished or in progress under the first and second grants is given in Table D on the next page.

### NCWM Certification Program

The Committee reviewed the status of the NCWM's certification program for weights and measures officials. Current program statistics indicated that only about a third of those who successfully completed NCWM courses for which certification is available had been awarded NCWM certificates. The Committee was concerned that the number is not higher. It was recognized that, in some cases, individuals take NCWM training in areas that do not currently fall within their specific work responsibilities; therefore, they may not need to be certified as being able to perform in the field the procedures covered by a particular module. However, the Committee would like to encourage States to complete the module training process and ensure that inspectors receive NCWM certification whenever possible. Field certification does not have to be conducted by the individual who teaches a module class. Jurisdictions that use an outside trainer to present modules can use their own staff members to certify inspectors. The individuals who certify inspectors need to be knowledgeable in the particular procedure that was covered by the module for which certification is sought; however, they do not themselves have to be certified or approved by the NCWM.

A summary of current participation in the NTP Certification Program is provided in Appendix A.

### NTP Registry

The NTP Registry serves as a permanent record of NCWM courses or NIST Office of Weights and Measures (OWM) metrology courses successfully completed and Continuing Education Units (CEU's) earned under the NTP. A summary of information in the Registry is found in Appendix B. The figures in Appendix B on the growth of the NTP Registry indicate a slight increase in the number of new entries processed in 1993 as compared to 1992 (from 309 to 373, a 20% increase).

**Table D**  
**Grant Accomplishments Status Report\***  
 (As of 6/30/94)

Module No.	Subject	Status
1	Mechanical Computing Scales	Information from this module was incorporated into Module 2.
2	Electronic Computing Scales	The revision of this module was completed, and copies were mailed to State Weights and Measures Directors.
4	Medium-Capacity Scales	First version of module and one revision completed.
5	Vehicle and Axle-Load Scales	First version of module and one revision completed.
6	Meat Beams and Monorail Scales	Project completed.
7	Livestock and Animal Scales	Project completed.
8	Retail Motor-Fuel Dispensers	First version of module and one revision completed.
10	Package Checking	Project completed.
13	Hopper Scales	The development of this module has been postponed until a review of resources and priorities can be completed.
19	Loading-Rack Meters	Project completed.
20	Vehicle-Tank Meters	Project completed.
21	LPG Liquid-Measuring Devices	Project completed.
22	Commodity Regulations	Project completed.
23	Intro to W & M Regulation	Project completed.
23A	Weights and Measures Admin. II	The Committee is planning to initiate a working group to develop a portion of the module.
24	Introduction to NIST Handbook 44	Project completed.
27	Electronic Weighing and Measuring Systems	Project completed.

\*Grant funds were also used to reformat Modules 2, 10, 7, and 27 so that they would be compatible with hardware and software used by the NCWM.



## 402-2 I Regional Training Activities

In 1992, the NCWM Executive Committee allocated \$15,000 to be divided among the four regional weights and measures groups to support regional training activities. The Education Committee was asked to manage the distribution of the funds. The deadline for requesting the funds was December 31, 1993; as of that date, only \$2,812.60 of the \$15,000 had been requested and only \$431.85 had been spent. At the Interim Meeting, the Education Committee asked the Executive Committee for an extension of the request deadline; however, the Executive Committee said that because of the regional groups' apparent lack of interest in spending the funds, it had zeroed out the remaining grant funds in 1994. The Executive Committee indicated that the funding requested by the Central Weights and Measures Association prior to the December 31 deadline would be made available.

In March 1994, the Central Weights and Measures Association (CWMA) requested and received \$1,074.75 as reimbursement for expenses incurred in connection with the presentation of a class on NCWM Module 10, Checking the Net Contents of Packaged Goods. CWMA had requested NCWM funds for this class prior to the Conference's December 31, 1993, deadline. In addition to providing training in Module 10, the class was intended to give a trainer from the central region experience in presenting a module in order to help him meet the requirements of NCWM's trainer certification program.

## 402-3 I NTP Survey

In November 1993, the Education Committee distributed a survey to State Weights and Measures Directors to help in reassessing the NCWM's National Training Program. The purpose of the survey was to determine what changes the Directors would like to see in the NTP so that the program would better serve their training needs now and in the future. A second survey was sent to weights and measures trainers to get their opinions on the types of changes that are needed.

Results of the State Directors survey and some preliminary results from the trainers survey were reviewed at the Interim Meeting. The final results of the trainers survey were reviewed at the 79th Annual Meeting. See Appendix C for a summary of the 31 responses received from State Directors and 23 responses received from trainers.

The responses to the State Directors survey and the trainers survey indicate that a high priority of the NTP should be the redesign of the existing training modules to eliminate duplication, making them shorter and more efficient to present (this was the first choice of Directors, second choice of trainers). Based on this finding, the Committee proceeded with its plans to propose a restructuring of the NCWM's scales training (see Item 402-6).

According to the State Directors survey, the second highest priority is the development of videos on device examinations. (This is sixth in the list of trainers priorities.) The Committee discussed at length how videos could be incorporated into the NTP. It was decided to pursue the possibility of experimenting with amateur videos developed by weights and measures jurisdictions as a lower cost alternative to using professional videos (which can cost from \$15,000 to \$30,000 for a 15-minute video). Six State Directors noted on the survey that their jurisdictions might be able to develop videos of device inspections. The Committee plans to find out exactly what type of help these Directors might provide and what it would cost. The Committee would also like to pursue whether Associate Members could help by developing short videos to introduce weights and measures officials to the types of devices and device features covered in the modules. The modules currently use slides to show officials what the devices look like and how they are used, but a video that showing how specific features operate would be much more effective. At the Annual Meeting, it was reported that the NCWM had made arrangements with the State of Virginia for the development of two videotapes on device inspections in return for some NCWM publications. One video on the inspection of retail motor-fuel dispensers has been completed and another on the inspection of retail computing scales is in progress.

The third highest priority selected by State Directors (the first priority of those responding to the trainers survey) was updating the existing modules. The Committee explored ideas for using new resources to aid in the revision of the modules, such as asking NCWM-certified trainers and regional weights and measures association education committees for help in reviewing and updating modules. The Committee also considered ways of encouraging individuals who teach modules to provide a marked copy of the module or a list of changes recommended to the NTP. In addition, the establishment of working groups or a subcommittee under the Education Committee for the purpose of updating modules was mentioned and is under consideration.

The Committee does not foresee any problems in getting volunteers to help revise modules. A number of individuals and groups have already contributed to the revision process. In addition, two State Directors responding to the NTP survey indicated that their jurisdictions could assist the NCWM in updating modules. The problem is that few people have the time or the resources to handle the entire revision process (see summary of the module revision process on the next page); therefore, some tasks usually remain to be completed by OWM staff or outside contractors. For example, if volunteers do not have computer software and hardware compatible with that used by the NIST Office of Weights and Measures, or if they are not skilled in using them, someone else must enter changes into the existing computer files. Also, some revisions involve changes to illustrations or visual aids; therefore, access to resources to make these changes is necessary to do a complete revision. In addition, some volunteers are not comfortable with writing chapter objectives and developing appropriate quiz and examination questions to reflect changes and additions in the module. Even relatively complete revisions prepared by volunteers must be given policy and editorial reviews to ensure that they are consistent with established NTP formats and NCWM policies and procedures.

Because of the limited resources within OWM, revisions prepared by volunteers sometimes must be put aside until time can be found to review or complete them. Anticipated additions to the OWM staff may help to reduce the backlog of revision projects. The Committee will continue to look for new ways to accomplish its objective of providing more timely revisions of the modules.

#### **402-4                    I            Module Revisions**

Revisions of Module 7, Livestock and Animal Scales; Module 21, Liquefied Petroleum Gas Liquid-Measuring Devices; and Module 27, Introduction to Electronic Weighing and Measuring Systems, are underway.

A summary of the revision status of all published NCWM training modules is shown in Table E on page 357. (See items 402-3 and 402-5 for additional information on module revisions.)

#### **402-5                    I            Revision of Retail Computing Scales Module**

The results of the field test of the Module 2 revision by State of Connecticut weights and measures officials were discussed by the Committee at the Interim Meeting. The final version of the revision was distributed to State Weights and Measures Directors in June 1994.

In addition to the usual updates of the technical information and references, the module includes the following significant changes:

- Information from Module 1 on mechanical retail computing scales has been incorporated into Module 2, which previously covered only electronic computing scales.
- Instructors will be permitted to delete up to 6 hours (1 class day) from the presentation of the module by eliminating material that has already been covered in other module classes. As a result, the course can now be taught in 25 hours or 4 days rather than the 62 hours (10 days) required to present Modules 1 and 2 separately.
- Instructions are provided for presenting the module in shorter increments of time over a longer time period (for example, two classroom sessions a week over a 3-week period).

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### Training Module Revision Process

1. Review the following and make appropriate changes in the Inspector's and Instructor's Manuals:
  - comments received since publication of the module
  - changes made to related modules
  - changes made to Handbook 44 since the module was published or last revised
2. Check each Handbook 44 definition and requirement cited in the module with the current edition of Handbook 44 for editorial changes (some modules have over 100 handbook references -- not counting definitions).
3. Make sure that the sources are noted for module definitions that are not from NIST Handbook 44 (for example, H-130, SMA, or other).
4. Evaluate each quiz (usually one at the end of each chapter) and final examination (two in each module) and clarify questions, change format of questions, add questions to address new information added to the module, and make other changes to the tests and their answer sheets as necessary.
5. Evaluate each slide and drawing in the module to be sure that it is clear and up to date and make changes where necessary. Add new visuals to illustrate changes to the module or enhance the instruction in the module where appropriate.
6. Add explanations, enhancements, and safety information to module text where needed.
7. In each Chapter, review the Chapter Objectives, the list of definitions to learn, and the chapter summary to determine if they are still appropriate and then make any changes needed.
8. In device modules, review and make appropriate changes to the Examination Procedure Outlines in the module, including changes to the Handbook 44 references and the safety information.
9. In device modules, check tolerance worksheets or sample reporting forms in the text, quizzes, and examinations to see if they are correct and up to date and make any needed changes or add new examples.
10. Review field training checklists to be sure that they are up to date and include safety requirements.
11. Review introductory material and the Continuing Education Unit information and make any changes needed; add a new Acknowledgements section for the revision.

#### Each Major Change Made to a Module May Affect the Following:

##### Inspector's Manual

Table of Contents  
 Chapter Objectives  
 One or more pages of text  
 Figures  
 Chapter summary  
 EPO's  
 Index  
 Definitions  
 Appendices  
 Field Training Checklist

##### Instructor's Manual

Table of Contents  
 Chapter Objectives  
 One or more pages of text  
 Quizzes  
 Final Examinations  
 Slides or other visuals  
 Definitions  
 Appendices  
 Field Training Checklist

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**Table E**  
**Module Revision Status**  
 (As of 6/30/94)

Module	Date of Publication	Date of Last Rev	Rev Stat*	Comments
27	1/28/85	10/86	U	The module is in the final stages of revision.
1	11/20/85	11/86	W	Information from this module has been incorporated into Module 2.
10	11/29/85	9/90	R	The Committee is planning to split the module into two segments. The NCWM NIST Handbook 133 Working Group will assist in the revision of the module.
2	2/26/86	5/94	N	The latest revision of Module 2 was sent to the States in June 1994.
8	7/14/86	9/90	N	
5	10/17/86	12/91	N	
20	10/31/86	12/91	N	
6	4/3/87		N	
7	5/27/87		U	The changes resulting from the field test of the draft revision of this module have to be made.
21	8/5/87		U	Tina Butcher and Dick Whipple of OWM and Will Wothlie of Maryland W&M have prepared a draft revision of the Inspector's Manual of this module.
4	6/22/88	10/92	N	
24	5/18/89	6/93	N	
22	6/8/90		N	
19	7/18/90		N	
23	6/14/93		N	

\*Key to module revision status abbreviations: N = No revision planned in 1994, U = Revision is underway, R = Revision is planned for 1995, W = Withdrawn 7/1/93.

## 402-6 V Redesign of the NTP's Training on Scales

(This item was adopted.)

The results of the surveys to reassess the NTP and set priorities for the future (see Item 402-3) indicated that the top priority of the program should be the redesign of the modules to eliminate duplication, making them shorter and more efficient to present. The Committee decided to begin this process by restructuring the NCWM's training on scales, which now consists of five modules describing how to conduct official examinations of: retail computing scales, medium-capacity scales, vehicle and axle-load scales, meat beams and monorail scales, and livestock and animal scales. Since each module was originally planned as a stand-alone training course for new weights and measures inspectors without any previous training and would contain all that the inspectors need to know to conduct an official examination for that type of scale, the five modules contain some of the same or similar information. Consequently, individuals who took two or more scales modules had to cover some material more than once.

We now are looking at ways to reduce class time and make the training process more efficient; therefore, the Education Committee is planning to eliminate as much duplication as possible. In addition, the Committee wants to reduce classroom time by making greater use of self-study programs, and to simplify the updating process for the training materials by limiting the reprints of Handbook 44 requirements and reducing duplicative discussions of requirements. With these objectives in mind, the Committee is proposing to restructure the NTP scales training as described in Appendix D. In summary, the restructured scales training would consist of two self-study courses: the existing Module 24, which is an introduction to NIST Handbook 44 that includes a detailed description of the requirements in the Handbook's General Code, and a new module on the Scales Code in H-44, which would address the reason for and an interpretation of each requirement in the Code. Individuals would be required to successfully complete these modules before getting credit for taking any of the modules on conducting official examinations of specific categories of scales or receive certification in any of the specific scale categories. (This does not necessarily mean that individuals would have to take the introductory modules prior to taking one of the specific scales modules, although that is the recommended way to structure the training.)

The modules on how to conduct an official examination on specific categories of scales would be designed for presentation in a classroom and would include hands-on demonstrations and practice sessions. The specific scales modules would include Examination Procedure Outlines (EPO), but would no longer include reprints of all paragraphs from Handbook 44 that are referenced in the EPO (since these paragraphs would have been covered in the self-study modules). Anyone needing to refresh his or her memory on the exact wording of a Handbook paragraph would be instructed to look it up in the Handbook. It is envisioned that the inspection portion of the specific scales modules would be structured like a checklist to indicate exactly what an official needs to examine on the types of devices covered by the module.

## 402-7 V Awarding of Additional CEU's for Completion of Revised Modules

(This item was adopted.)

Last year, the Committee initiated a policy of awarding additional Continuing Education Units (CEU's) to individuals who retake a module course following a major revision of the module. It was the Committee's intention to initiate the policy beginning with the revision of NCWM Module 5, Vehicle and Axle-Load Scales, because the extensive nature of this revision raised questions about whether additional CEU's could be given for retaking a module. The Committee's plan was to give additional CEU's for retaking Module 5 and Module 4, Medium-Capacity Scales (another major revision that was published about the same time as Module 5), and then to review each new revision to determine whether it was significant enough to justify giving additional CEU's. Some concerns were raised by the Central Weights and Measures Association (CWMA) concerning the implementation of the new policy. CWMA members wanted the NCWM to award CEU's to individuals any time they retook a module, whether or not the module had been revised. Preliminary discussions with the International Association for Continuing Education and Training (IACET), the organization that establishes the criteria for awarding CEU's, indicated that IACET was not in favor of the policy proposed by CWMA. In response to a request from the NCWM, IACET recently issued a formal written policy statement on the awarding of CEU's for retaking a course, which was reviewed at the Interim Meeting. See Appendix E for a copy of IACET's



## Education Committee

response.

At the Interim Meeting, the Education Committee reevaluated its overall policy on CEU's taking into account CWMA's comments and the results of the NTP training surveys. The issues addressed, a summary of some of the factors considered, and the Committee's position on each issue are shown below.

### Committee Recommendation:

**The Education Committee proposes that the NCWM adopt the policies on CEU issues recommended below:**

- Issue 1:** Should additional CEU's be awarded?  
**Factors:**
- IACET says that, in general, they do not recommend the practice; however, in some instances it may be appropriate.
  - The majority of State Directors responding to the NTP Survey said additional CEU's should be given (23 yes, 6 no, 2 don't know).

### Committee

**Recommendation:** Continue with plans to award additional CEU's.

- Issue 2:** If additional CEU's are awarded, under what circumstances should they be given?  
**Factors:**
- State Directors Survey results:
    1. When an individual retakes a course that has been substantially revised since the last time the course was taken. (18 votes)
    2. When an individual retakes any course that has been revised, even if only a few changes have been made. (2 votes)
    3. Any time an individual retakes a course, whether or not the course has been revised. (3 votes)
    4. Any time an individual retakes a course after a specified period of time, whether or not the course has been revised. (17 votes)
  - What period of time:
    - 5 years (5 votes)
    - 3 years (4 votes)
    - 2 years (3 votes)
    - 4 years, 3-5 years, 3-4 years, 4-5 years, 90 days (1 vote each)
  - IACET identifies two circumstances under which it is appropriate to award additional CEU's:
    1. When an individual retakes a course that has been substantially revised since the last time the course was taken.
    2. When periodic updates are needed to ensure that an individual retains certain skills.

### Committee

**Recommendation:** Additional CEU's will be awarded when an individual retakes a course that has been significantly revised since the last time the course was taken and any time an individual retakes a course after a 5-year period, whether or not the course has been revised.

- Issue 3:** When should any policy to award additional CEU's take effect?  
**Factors:**
- It should begin with the Module 5 revision and apply to module revisions published about the same time and any new module revision. (Committee's original position.)
  - It should be retroactive and cover all revised modules. (Central's position.)
  - It should apply only to new module revisions.

### Committee

**Recommendation:** The policy should be retroactive and cover all revised modules.

- Issue 4:** How should "significant revision" be defined?  
**Factors:**
- The Central and the Southern Weights and Measures Associations suggested that any module that is completely republished and is given a new effective date should be considered a "significant revision."
  - The original interpretation was that a "significant revision" was more than just a simple update of the paragraph references from Handbook 44 (the NCWM Uniform Administrative Procedures for Certification of Weights and Measures Officials require State certifying officers to ensure that certified

individuals receive annual updates on any applicable Handbook 44 changes), but included major additions of new requirements or major changes to tolerances or marking requirements or a combination of these.

#### Committee

**Recommendation:** Any module that is completely republished and is given a new effective date will be considered a "significant" revision. If only change pages are issued or if the module is republished without a new effective date, the revision will not be considered "significant."

## 402-8 I Certification of NTP Trainers

A status report was presented on the NTP Certification Program for Trainers. As of January 1994, the following 10 individuals had been awarded certification: Kenneth S. Butcher, NIST/OWM; Barbara J. DeSalvo, OH; Frank W. Forrest, CT; Paul Peterson, USDA/P&SA; Thomas M. Stabler, IWM; Don E. Stagg, AL; Richard C. Suiter, NE; José A. Torres, PR; James A. Vanderwielen, USDA/P&SA; and Kenneth A. Wheeler, OH.

The education committees of the regional weights and measures associations are encouraged to identify possible candidates for certification within their regions and consider ways to assist these individuals in obtaining certification, such as mailing them copies of the application form and offering them advice and assistance in filling out the form.

## 402-9 I Weights and Measures Administration Module

This was item 402-9 in the Committee's Report to the 78th NCWM; see that report for additional information on this subject. The Education Committee submitted a request to the Executive Committee for resources to complete and maintain the Weights and Measures Administration Module, Part II, which is an administrative manual for weights and measures administrators and supervisors that will contain information on how to organize, administer, justify, and maintain a regulatory weights and measures program. Part I of the module, which is a self-study course that provides an introduction to regulatory weights and measures programs in the United States, was published in 1993.

The Committee requested \$60,000 (\$15,000 a year for 4 years) to complete the remaining 12 chapters of the module (three chapters have already been written) and \$10,000 a year after the completion of the module to cover the cost of module maintenance and the development of new chapters as necessary. (See Appendix F for a copy of the request, which includes a history of the Education Committee's efforts to complete the weights and measures administration module.) The funds were to be used to pay a professional writer and weights and measures jurisdictions for development of the chapters in the module.

In the NTP survey, State Weights and Measures Directors rated completion of the second part of the administration module fifth in the list of NTP priorities and third in the list of priorities for the use of the remaining grant funds from NIST. Although completion of the module is a high priority, the Committee feels that work should not continue until a commitment is made for funds, not only to develop the module, but to maintain it.

The Executive Committee asked the Education Committee to determine priorities for all of its areas of responsibility as defined in the NCWM Bylaws in order for the Executive Committee to assess where and when money should be spent. (See Item 404.)

At its special meeting in April 1994, the Committee decided to develop sections of this manual using working groups consisting of NCWM active and associate members. One or more groups will be established each year. The plan is to develop the report of the working group into a section or chapter of the administrative manual. The goal of the Committee is to use the information gathered by the working groups to develop criteria that could be used to certify weights and measures jurisdictions. The first topic selected is "Program Evaluation." The working group will be asked to identify and define critical information that weights and measures jurisdictions should collect to show the impacts of their programs and make decisions about the allocation of resources.

#### **402-10 I Development of a Field Test Manual**

Bill Braun and Tom Stabler of the Institute for Weights and Measures met with the Committee and gave a status report on their plans to develop a Field Test Procedures Manual that could be used by new and untrained weights and measures officials and service/industry personnel. Mr. Stabler gave the Committee a draft of a section of the manual that covered a field test procedure for bench/counter scales with a scale division of 0.005 pound. Committee members were asked to review the draft and send their comments to Mr. Stabler. The Committee will follow the progress of the field test manual and evaluate how it might relate to the restructuring of the scales modules.

At the NCWM Annual Meeting, Bill Braun gave the Committee a second draft of the first section of IWM's field test manual for comment.

#### **402-11 VC Participation by Other Countries in the NTP Certification Program**

(This item was adopted as part of the consent calendar.)

Last year the Committee asked for comment on a proposal to permit other countries to participate in the Certification Program of the National Training Program. At the present time, individuals from other countries who participate in training module courses sponsored by Certification Program participants may receive CEU's for successfully completing a course, but are not eligible to receive NTP certification. The Committee reviewed the comments on this issue that were received from the regional weights and measures associations and found no opposition to permitting other countries to participate in the certification program, provided they sign a Letter of Agreement with the NCWM and follow the requirements of the NTP.

##### **Committee Recommendation:**

**Revise the NCWM "Uniform Administrative Procedures for Certification of Weights and Measures Officials" as shown in Appendix G to permit other countries to participate in the Certification Program, provided they sign a Letter of Agreement with the NCWM and promise to adhere to the NCWM's procedures and train officials in accordance with the NCWM's training modules.**

Revisions proposed by the Committee are shown in Appendix G by highlighting information to be added and ~~crossing out~~ what is to be deleted.

#### **402-12 VC NTP Record Keeping Requirements**

(This item was adopted as part of the consent calendar.)

States must sign a Letter of Agreement with the NCWM that stipulates adherence to the requirements of the "Uniform Administrative Procedures for the Certification of Weights and Measures Officials" (see Appendix G) in order to participate in the NCWM Certification Program. These procedures state that it is the responsibility of the State Certifying Officer to establish a training file on each State official who participates in NCWM training courses. The procedures also describe the type of information that must be kept in the file.

The Committee was asked by a State training officer for guidelines on how long the required information must be kept. It reviewed the list of required information and decided that some changes were needed to clarify what had to be included in the file. In addition, the Committee decided to use the International Association for Continuing Education and Training's definition of a permanent record (namely, a period of at least 7 years) as the basis for the NCWM's requirements.

**Committee Recommendation:** Replace item V.A.3. in the Uniform Administrative Procedures with the following:

**3. Establish a training file on each participant to include:**

- a. For each NCWM course completed: the course number, the dates of the course, the participant's score on the final examination, the date on which the jurisdiction applied for certification of the participant, and the date that the certification certificate was received;
- b. A copy of all NCWM Certificates of Completion received by the participant;
- c. Copies of the participant's Field Evaluation Forms;
- d. Copies of the Request for Individual Certification Forms sent to the NCWM on behalf of the participant; and
- e. Copies of all Certification Certificates received by the participant.

These records must be maintained for a period of at least 7 years.

**402-13                      W        Expansion of NTP Registry**

(This item was withdrawn.)

The feasibility of expanding the NTP to include courses developed by State and local weights and measures jurisdictions was discussed. The Committee considered a program that would make it possible for a jurisdiction to develop a course for its inspectors and then submit it for approval to the NCWM. The NCWM would determine if the course met established criteria, and, if so, the course would be officially recognized, CEU's would be awarded to participants taking the course, and records of completion of the course would be maintained in the NTP Registry. Although Committee members recognized the benefits of such a program, they felt that the NTP did not have the resources to administer the program at the present time; therefore, this item was withdrawn.

Jurisdictions that would like to award CEU's to participants in their training programs, can contact the Education Committee's Technical Advisor to get information on the requirements for establishing a CEU program.

**403                                      Administration**

**403-1                                  I        Enforcement Actions**

This was Item 404 in the Committee's Report to the 78th NCWM (see that report for additional background information). The Committee reviewed feedback from the regional weights and measures groups on a proposal to change the current guidelines with regard to enforcement actions (such as those in the Fundamental Considerations Appendix in Handbook 44) to reflect current practices and to establish standard definitions for such terms as "rejected," "rejected for repair," and "condemned," which have different meanings in different jurisdictions. Specific wording for the proposed changes to NIST Handbooks 130 and 44 were discussed at the 1994 NCWM Annual Meeting (see Appendix I). Copies of the proposed changes will be forwarded to the NCWM Laws and Regulations Committee (L&R) and Specifications and Tolerances Committee (S&T) for consideration.

**404                                      I        Consumer Affairs**

With the proposed disbanding of the NCWM's Liaison Committee, the Education Committee has been asked to take on additional responsibilities in the areas of consumer and public affairs. The Committee discussed how it could respond to these new responsibilities and determined that it needed help to address the new activities and develop a more aggressive consumer/public affairs program. A request for the establishment of a subcommittee for this purpose was given to the Executive Committee. It was envisioned that the subcommittee, to be composed of both weights and measures officials and associate members, would take on projects such as the following:



## Education Committee

- Publicizing Weights and Measures Week and helping to keep NCWM Publication 7, Weights and Measures Week Guide, up to date
- Keeping the **Getting What You Pay For** brochure up to date and perhaps having it translated into Spanish
- Developing additional consumer and retailer brochures on weights and measures related topics such as price verification, metric labeling, and unit pricing
- Maintaining contacts with consumer groups and encouraging their involvement in Conference activities as needed
- Developing sample news releases on weights and measures topics for distribution to the States
- Writing portions of Part II of the Weights and Measures Administration Module that relate to consumers, such as the section on complaint handling.

The Executive Committee asked the Education Committee to look at all of its responsibilities in the areas of education, administration, and consumer affairs and then develop a management plan for addressing those responsibilities, which might include recommendations for the creation of new working groups or subcommittees needed to help the Committee reach its goals in each area of responsibility. Money was allocated for a special meeting of the Education Committee in the spring of 1994 to develop the management plan.

The special meeting was held in April 1994. As a result of the meeting, the Committee is requesting a change in its name and scope and a new mission statement to reflect a broadening and refocusing of its activities. It was suggested, for example, that the term "consumer affairs" was too narrow in scope because it represents only one segment of the NCWM's constituents. It was felt that the term "public affairs" is more comprehensive and highlights the need to establish and maintain contacts with more of the groups that impact or are impacted by actions of the Conference. (For a full report of the meeting, see Appendix J.)

At the end of the special meeting, the Committee identified tasks that needed to be undertaken prior to the NCWM Annual Meeting. In the area of public affairs, plans were made to publicize issues to be addressed at the Annual Meeting. Subsequent to the meeting, key issues were identified (e.g., price verification, CNG method of sale, Handbook 133 changes) and press releases and cover letters were sent to major publications in the subject areas. The Technical Advisors for the EA&CA and L&R Committees also met with concerned industry associations to seek their help in publicizing NCWM issues.

During the Annual Meeting, the Committee decided that its focus for the next 6 months will be on developing information for decision makers and, in particular, on developing a strategy for State Weights and Measures Directors to use in meetings with legislators.

Members of the Committee met with Susan Grant, Executive Director of the National Association of Consumer Agency Administrators (NACAA), at the Interim Meeting to learn more about her organization and see if they could identify areas of mutual interest. The Committee is evaluating how it might work with NACAA to achieve common goals.

## 405 I Safety

Charles Gardner, the NCWM Safety Liaison, reported that NIST had received clarification from the U.S. Department of Transportation (DOT), Research and Special Programs Administration, concerning the applicability to weights and measures officials of the hazardous materials training requirements that were published in the Code of Federal Regulations (CFR), Title 49, Part 172, Subpart H. DOT says that the training requirements do not apply to State and local weights and measures officials transporting hazardous materials in government vehicles because such transport is not considered to be "in the furtherance of commerce." However, the training requirements do apply to private companies that are hired by weights and measures jurisdictions to perform some of their functions. (See Appendix H for a copy of DOT's letter.) Although the DOT requirements do not apply, the Education Committee urges State and local jurisdictions to establish their own hazardous materials training programs if they do not currently have such programs.



Mr. Gardner said that he had received a reply to the letter he sent to Timothy Gerrity of the Health Effects Research Laboratory of the U.S. Environmental Protection Agency (EPA) offering the NCWM's assistance in helping EPA find weights and measures jurisdictions that could gather information, collect evidence, or conduct tests on potential health effects of motor fuels and motor fuel additives. Dr. Gerrity stated that he may contact the NCWM if assistance is needed in a study EPA is doing on the health effects of MTBE; in any case, he said he would send a copy of the completed study to Mr. Gardner. (See Appendix H for a copy of Mr. Gardner's letter and Dr. Gerrity's response.)

Mr. Gardner also noted that he had received information from Max Gray, Chief of the Florida Bureau of Weights and Measures (and member of the Education Committee), on a study conducted by the State Division of Safety on employee exposure to lead in the metrology laboratory. The study found that no serious problem existed in the laboratory and that, through some simple housekeeping improvements, the potential for exposure to lead could be minimized. (See Appendix H for a copy of Mr. Gray's letter and the attached study report.)

The Education Committee discussed the feasibility of serving as a clearinghouse for the collection and publication of reports of accidents involving State and local weights and measures officials. Mr. Gardner said he would develop a draft of a form for collecting this information. The draft form was reviewed by the Committee at the Annual Meeting.

J. Harnett, Orange County, California, Chairman

B. DeSalvo, Ohio

M. Gray, Florida

B. Martell, Vermont

E. Price, Texas

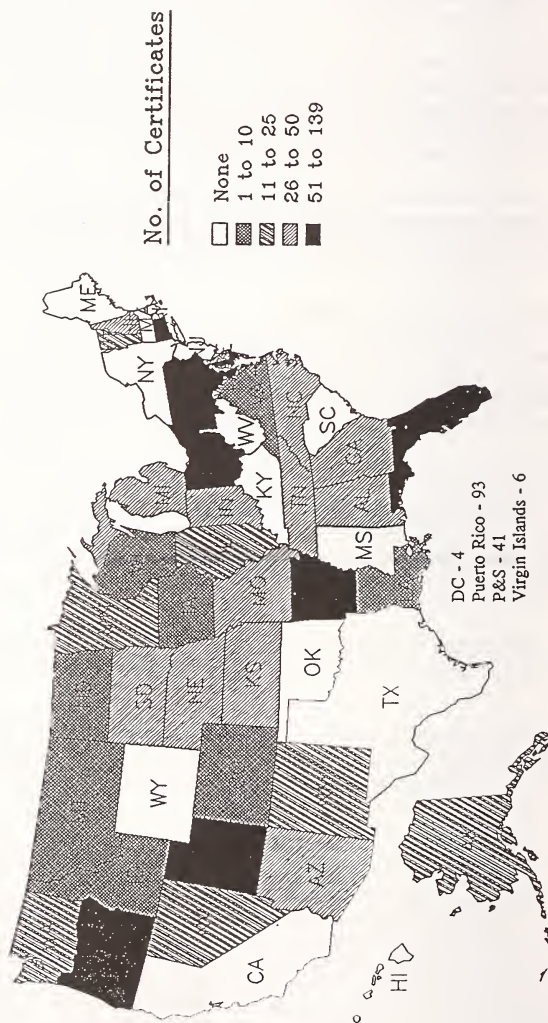
C. Gardner, Suffolk Co., NY, Safety Liaison

J. Koenig, NIST, Technical Advisor

## **Committee on Education, Administration, and Consumer Affairs**

## Appendix A

National Training Program  
Certification Program Certificates Issued  
(As of 6/30/94)



# Certification Summary

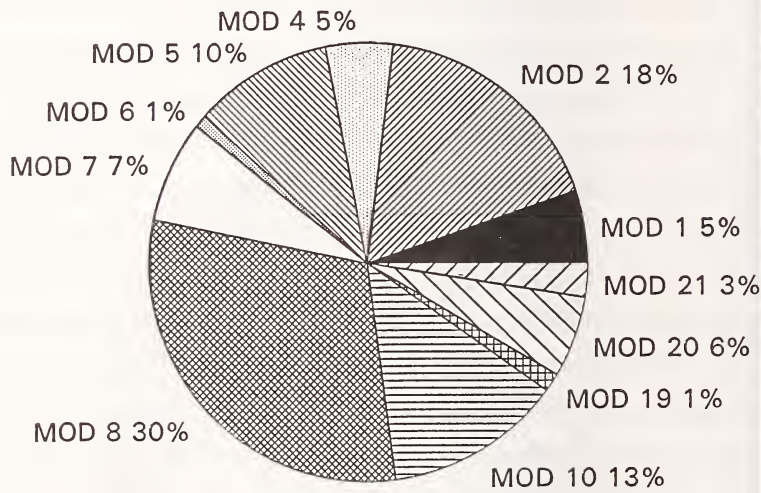
(As of June 30, 1994)

State	Total No. of Certif.	Total No. of People	Module Number										
			1	2	4	5	6	7	8	10	19	20	21
AL	43	24		14	12			5	12				
AK	19	10		7		1			10	1			
AZ	28	28		28									
AR	129	42	20	19		10		9	40	12		16	3
CO	7	7						7					
CT	65	23		15	19	2			3	15	6	3	2
DE	5	5								5			
DC	4	3							3		1		
FL	88	70	6	8	3	7		2	33	16	6	7	
GA	29	24				8		4	17				
IA	1	1						1					
ID	8	8							8				
IL	17	17		8		9							
IN	29	29				29							
KS	28	15	7	7		4			1	9			
LA	9	9						8		1			
MD	64	34							27		4	33	
MI	38	13				8		11				13	6
MN	15	15							15				
MO	32	31							13	19			
MT	7	7						7					
NE	35	19		2		7			15	11			
NV	11	9		1		1			8				1
NH	32	8	6	5	5	2			6			8	
NM	20	15		1					9				10
NC	39	34							20	19			
ND	3	3							3				
OH	139	70		38	17	15		9	45	9			6
OR	54	16	16	15		5			10	6	1		1
PA	77	41		26	4			7	18	18		4	
PR	93	45		32					33	28			
SD	28	13			7	12			8	1			
TN	40	29				5		6	29				
UT	66	17	16	15		6		4	13	11			1
VT	19	8	4		2	1		3	7	1	1		
VI	6	6				6							
VA	2	2											2
WA	21	16		5					15				1
WI	3	3											3
Other													
P&S*	40	32				6	13	21					
Totals	1,393	801	75	246	69	144	13	104	421	181	19	84	36

Packers and Stockyards Administration

# Module Certification

(Percentage of Total)



Data as of 6/30/94



**NATIONAL TRAINING PROGRAM REGISTRY**  
**SUMMARY OF ACTIVITY**  
 (As of June 30, 1994)

**Courses Listed in Registry:**

Module 1, Retail Computing Scales - Mechanical	Module 19, Loading-Rack Meters
Module 2, Retail Computing Scales - Electronic	Module 20, Vehicle-Tank Meters
Module 4, Medium-Capacity Scales	Module 21, LPG Liquid-Measuring Devices
Module 5, Vehicle and Axle-Load Scales (Version 2: 3/6/92)	Module 22, Commodity Regulations
Module 6, Meat Beams and Monorail Scales	Module 23, Introduction to Weights & Measures Regulation in the U.S.
Module 7, Livestock and Animal Scales	Module 24, Introduction to NIST Handbook 44
Module 8, Retail Motor-Fuel Dispensers and Consoles	Module 27, Introduction to Electronic Weighing and Measuring Systems
Module 10, Checking the Net Contents of Packaged Goods	

**Appendix B**

State	Individuals Trained - by Module																Totals
	1	2	4	5	5 <sup>1</sup>	6	7	8	10	19	20	21	22	23	24	27	
AL	15	12	4				4	32							12	26	105
AK	7		1					10	8								26
AZ	27						6		17			25	1				78
AR	20	20		10			8	42	12		17	3			13		145
CA							1										1
CO							9	1	1								11
CT	22	20	2					22	18	12	6	2	26				130
DE			1						5		2						8
DC	4	4						3		1						13	12
FL	13	24	15	13			10	57	39	8	8				43	41	271
GA			11	8			4	17								7	47
HI									14							4	18
ID		9		39				10				10	10			8	86
IL		8	1	9				23	2				1				44
IN		43	45	42				84				2	27		48	48	340
IA				17			3	4					2				26
KS	9	10	14	5			4	18	32		2				3	8	105
KY	8	8	1	5				19	16								57



# National Training Program Registry Summary of Activity (Continued)

Individuals Trained - by Module																										
State	Module Number																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Totals
LA							8		1																	9
ME				3	9			14													6				4	36
MD		29					6	28		4	33										4			6		110
MA		23		4	5			16		3	31									4				12		101
MI		50			13		19	2	29		22									13			18	53		219
MN								12		2										2		1				17
MS				2	3		3																			8
MO				13				40		27													1	61	22	164
MT				5			7	6												1				8		27
NE		17		4	30	8	14	24		18										2	15	14		17	27	182
NV		1			1			11												1				10	7	31
NH	6	5	7	2				7								8	2								6	43
NJ		21		21				108			109														172	431
NM		12					13	17	25											13						80
NY		74								92										9						175
NC						2	2	18	19												16					57
ND								3		3										3					12	21
OH		74		47	44		4	65		55										14	9	12	29	56	89	543
OK				2				5		22														17	2	48
OR	18	17			8			12		16											16			23	16	139
PA	34	96		51	8		8	86		58										25	1	19		27	82	495
PR		32						33		24														38	20	147
RI		1			1															1						3
SC		25					2	28																		55
SD				7	12		9	8	10											1	10				10	67

**National Training Program Registry  
Summary of Activity  
(Continued)**

Individuals Trained - by Module																			
State	Module Number																		Totals
	1	2	4	5	5 <sup>1</sup>	6	7	8	10	19	20	21	22	23	24	27			
TN		27		6		6	32									5	76		
TX		25				8	24					4			5		66		
UT	17	16		11		4	13	13				1			13	17	105		
VT	6		3	2		3	11	1	1			2	2			5	36		
VI				6			6	6						5			23		
VA			24	16		5	17	38		25	4			39	7	43	218		
WA	13	8		16			16					1	14		6	16	90		
WV						3											3		
WI	56	61		19			40	43		26	10					65	320		
WY			11				16				10				11	3	51		
Other																			
Associate Members																			
FGIS*																			13
1P&S**																			3
Total Trained	204	811	325	369	54	29	219	1,066	674	42	329	168	173	88	437	854	6,778		
Percentage of Total Certified <sup>1</sup>	37%	30%	21%	39%	0%	45%	47%	40%	27%	45%	26%	23%	NA	NA	NA	NA	33% <sup>2</sup>		

\* Federal Grain Inspection Service

\*\* Packers and Stockyards Administration

<sup>1</sup>Module 5 update of March 6, 1992<sup>2</sup>A total of 1,393 certificates have been awarded to 801 individuals under the NTP Certification Program.



**NATIONAL TRAINING PROGRAM REGISTRY  
SUMMARY OF METROLOGY SEMINAR ACTIVITY  
(As of June 30, 1994)**

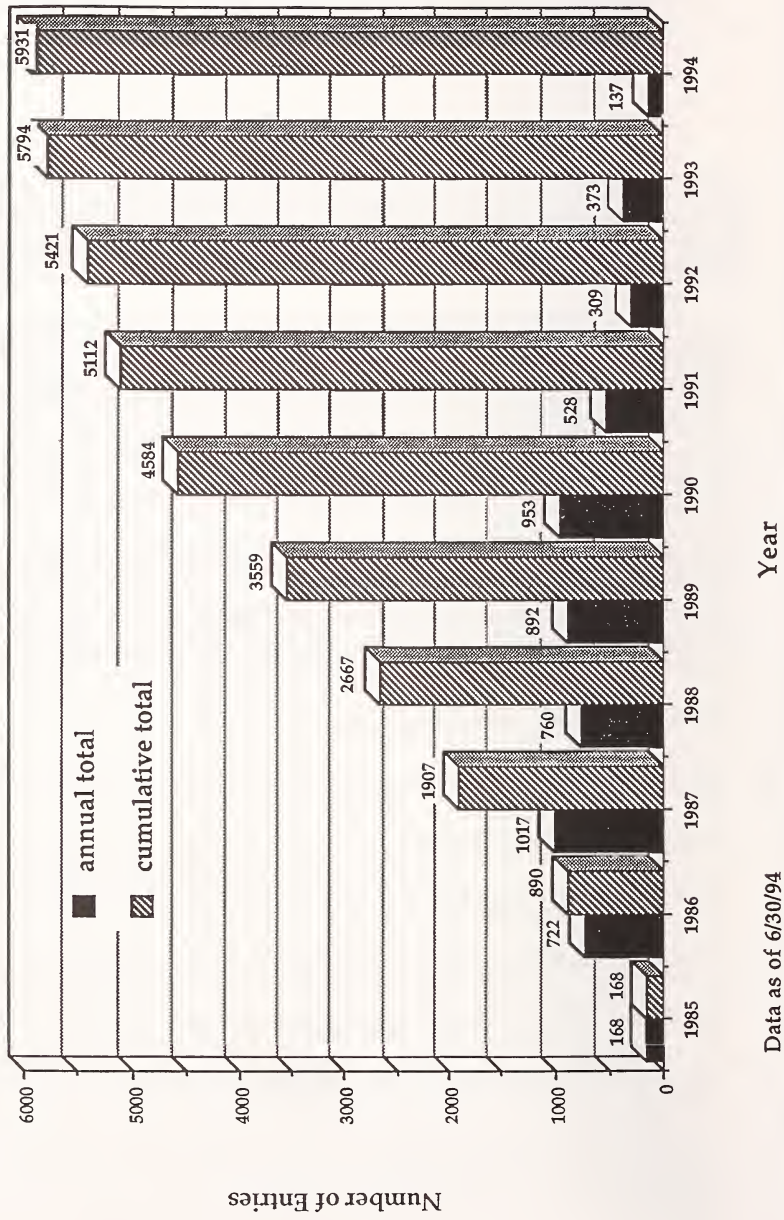
## Courses Listed in the Registry:

No. 201, Basic Metrology I  
No. 202, Basic Metrology II  
No. 203, Intermediate Metrology  
No. 204, Advanced Metrology

Individuals Trained by Course					
State	Course No.				Totals
	201	202	203	204	
AL		1			1
AK			1		1
AZ	2	2	1		5
CO	2	2	1		5
CT			1		1
DE	1	1	1		3
FL	3	3			6
GA	1	1			2
HI	2	2			4
ID	1	1	1		3
IL	3	3	1		7
IN			1		1
KS	1	1	2	1	5
KY	2	2			4
ME	2	2			4
MD	6	6	7		19
MA	1	1			2
MI	1	1	2		4
MS	1	1	1		3
MO	1	1	1		3
NV	1	1			2
NY	2	2			4
NC	5	5	2		12
ND	1	1			2
OH	1	1			2
OK			1	1	2

Individuals Trained by Course					
State	Course No.				Totals
	201	202	203	204	
PA			1		1
PR	2	2	5		9
RI	1	3			4
SD	1	1			2
TN	1	2			3
TX	3	3	1		7
VA	2	2	2		6
WV	2	2			4
WI			2		2
Other			7		7
Canada			1		1
Totals	52	56	43	2	153

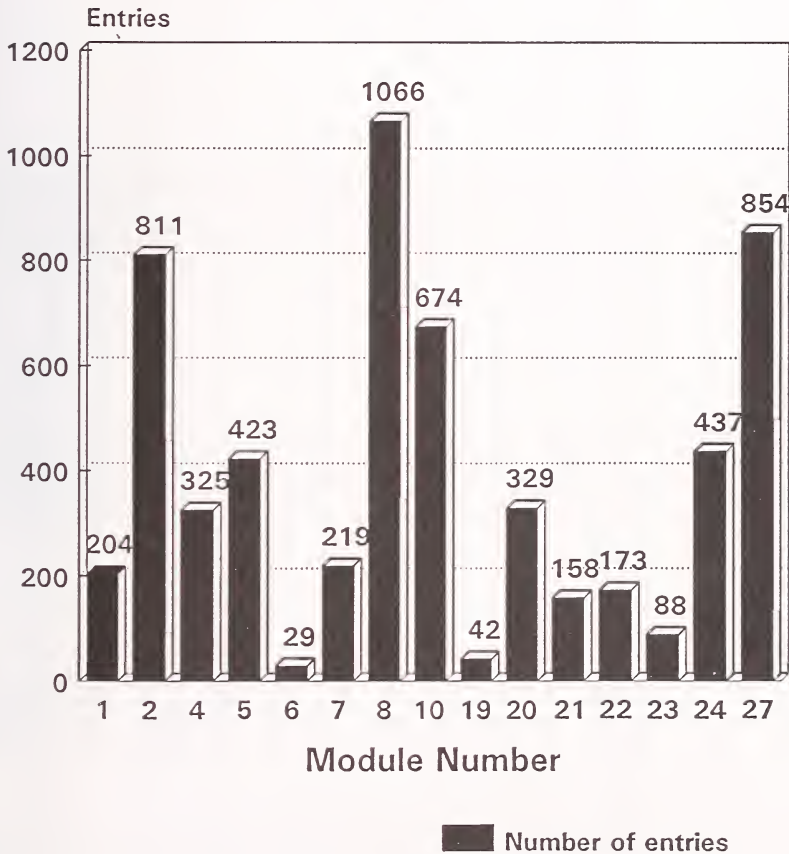
# Growth of NTP Registry (Annual and Cumulative Data)



Data as of 6/30/94



# Entries in NTP Registry By Module



Data as of 6/30/94

Continuing Education Units (CEU's) Awarded  
By the National Conference on Weights and Measures  
(As of June 30, 1994)

Module Number	CEU's	No. of Participants	1985 Total	1986 Total	1987 Total	1988 Total	1989 Total	1990 Total	1991 Total	1992 Total	1993 Total	1994 Total	Grand Total
1	3.1	204		306.90	77.50	117.80	99.20	24.80		3.10	3.10	0.00	632.40
2	3.1**	811		65.10	857.90	759.50	173.60	244.90	31.00	297.60	3.10	0.00	2,432.70
4	3.1	325				492.90	198.40	170.50	145.70			0.00	1,007.50
5	3.1	569			36.10	133.30	381.30	217.00	220.10	18.60	52.70	24.80	1,143.90
6	3.1	29			12.40			55.80		15.50	6.20	0.00	89.90
7	3.1	219			12.40		248.00	117.80	80.60	80.60	130.20	3.10	678.90
8	2.8	1,056		288.40	856.80	260.40	739.20	299.60	112.00	156.80	252.00	16.80	2,984.80
10	2.8	674		372.40	302.40	128.80	417.20	120.40	148.40	123.20	177.20	5.60	1,888.00
19	3.5	42						59.50	49.00	38.50		0.00	147.00
20	2.8	329			156.80	109.20	109.20	338.80	92.40			5.60	921.20
21	3.5	158			105.00	129.50	147.00	52.50	31.50		42.00	7.00	553.00
22	2.45	173						230.30	191.10	2.45		0.00	423.85
23	1.00	88									57.00	23.00	88.00
24	1.5	437					15.00	402.00	156.00	34.50	34.50	1.50	655.50
27	1.1	854		402.60	165.00	66.00	36.30	22.0		24.20	53.90	1.10	939.40
<b>Totals</b>		<b>6,778.00</b>	<b>230.70</b>	<b>1,435.40</b>	<b>2,642.30</b>	<b>2,197.40</b>	<b>2,564.40</b>	<b>2,355.90</b>	<b>1,257.80</b>	<b>795.05</b>	<b>811.90</b>	<b>295.20</b>	<b>14,586.05</b>

\*\*One Module 2 class with 74 participants was given only 2.00 CEU's.

\* One CEU is equivalent to 10 contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction.

**Continuing Education Units (CEUs) Awarded  
By the National Conference on Weights and Measures  
For Attendance at OWM Metrology Seminars  
(June 30, 1994)**

Course No.*	No. of CEUs**	Participants	1990 Total	1991 Total	1992 Total	1993 Total	Grand Totals
201	3.60	52	97.20	54.00	7.20	28.80	187.20
202	3.50	57	101.50	52.50	17.50	28.00	199.50
203	3.10	42	49.60	40.30	34.10	6.20	130.20
204	2.50	2				5.00	5.00
Totals		153	248.30	146.80	58.80	68.00	521.90

\* Course No. 201: Basic Metrology I  
 Course No. 202: Basic Metrology II  
 Course No. 203: Intermediate Metrology  
 Course No. 204: Advanced Metrology

\*\* One CEU is equivalent to 10 contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction.

## Appendix C

### Summary of the Results of the NTP Survey Of State Weights and Measures Directors

Total Responses: 31

**Introduction** - The purpose of this survey is to obtain information that will help the Conference plan the future direction of the National Training Program. It begins with questions on the current program in order to assist you in assessing what you like or do not like about what is now in place. It then asks for your views on how the program could be improved so that we can better serve your training needs now and in the future.

**Part I - Current Program** - The following questions are intended to assess your views on the existing training modules and programs of the NTP.

#### Modules

1. How would you rate the overall usefulness of the NCWM Training Modules to your Weights and Measures Program? (Circle your answer.)

1	2	3	4	5
Not useful		No opinion		Very useful

**OVERALL RATING: 4.2**

2. How does your jurisdiction use the NCWM training modules? (Circle all that apply.)

- a. As the basis for classroom or self-study training of weights and measures officials. **N=25**
- b. As reference materials for inspectors. **N=24**
- c. As models for courses developed by the jurisdiction. **N=6**
- d. Parts are copied and distributed to inspectors or the public in response to inquiries about policies or procedures. **N=9**
- e. As a basis for registration of service personnel. **N=2**
- f. Other (please specify):

**Comments:** "Integrate selected slides, test questions, diagrams into existing training program." "Self-study courses for new employees."

- g. Do not use the modules. **N=1**

3. Using the table on the page 4, please rate each published training module on its usefulness (how well it meets your jurisdiction's needs for training in the subject area), adequacy of content, and appropriateness of length. (Check the appropriate box in the table to indicate your rating. If you are not familiar with a particular module or a certain aspect of the module, leave the appropriate boxes blank.)

4. What do you like best about the modules?

**Summary of comments:** The modules provide uniform, structured training that follows a logical learning sequence. They also consolidate comprehensive information on a specific subject in one manual and provide a useful, flexible training tool for inspectors. They are very understandable and study quizzes help you check your progress. In addition, they are good reference sources.

5. What do you like least about the modules?

**Summary of comments:** Some of the illustrations are usually poorly drawn and there are not enough pictures of actual devices. Some modules are too lengthy and too technical. Modules are not updated quickly enough. There is duplication of information.

Module	Usefulness			Content			Length		
	not useful	useful	very useful	too extensive	about right	not enough detail	too long	about right	too short
Mod 2, Retail Computing Scales		14	10		24		5	17	
Mod 4, Medium-Capacity Scales		17	5		19		6	13	
Mod 5, Vehicle & Axle-Load Scales		12	12	1	19		5	15	
Mod 6, Meat Beams & Monorail Scales	7	6	2		8		4	3	
Mod 7, Livestock & Animal Scales	1	13	9	1	18		4	15	
Mod 8, Retail Motor-Fuel Dispensers		8	15		20		1	17	
Mod 10, Checking the Net Contents of Packaged Goods		8	14	9	11	1	9	8	
Mod 19, Loading-Rack Meters	2	9	4		11		3	8	
Mod 20, Vehicle-Tank Meters	2	11	5		15		3	9	
Mod 21, LPG Liquid-Measuring Devices		11	7		15		3	11	
Mod 22, Commodity Regulations		9	5	1	10	1	4	8	
Mod 23, Intro. to W&M Regulation		8	7		9	3	2	11	
Mod 24, Intro. to NIST Handbook 44		8	13		16	1	2	16	
Mod 27, Intro. to Elect. W&M Systems	1	10	4		10	4	2	7	2



## Education Committee

### CEU's

6. The Conference now awards Continuing Education Units (CEU's) to individuals who successfully complete the classroom portion of the training modules. The CEU is a nationally recognized measure of noncredit continuing education learning experiences. How would you rate the overall importance of CEU's to the individuals who take module training in your jurisdiction: (Circle your answer.)

1 N=4	2 N=7	3 N=5	4 N=7	5 N=8
Not important	No opinion		Very important	

### OVERALL RATING: 3.3

**Summary of comments:** The comments ranged from "Most of the time, it makes no difference to the person" and "The CEU's mean very little, but the availability of a transcript and records mean a lot" to "The CEU's are the rewards for adult students."

7. It costs the Conference \$3 to record CEU's for individuals each time they take a module class (the total annual cost to the NCWM averages about \$2,000). CEU's serve three major purposes: 1. they provide recognition for individual effort and achievement, 2. they help the NCWM keep track of which courses are being used, and 3. they are quality control measures that let instructors know how much time is needed to adequately cover a specific course. Do you think the cost of awarding CEU's is justified by the benefits to the NCWM, the individuals concerned, and your training program? (Circle your answer.)

Yes	N=16	No	N=4	Don't know	N=11
-----	------	----	-----	------------	------

8. Would your jurisdiction be willing to pay the \$3 per person cost to have your officials awarded CEU's?

Yes	N=10	No	N=13	Don't know	N=8
-----	------	----	------	------------	-----

9. Do you require individuals to obtain a certain number of CEU's in order to retain their jobs, get promotions, or for any other reason? (If you answer "yes," please describe your requirements below.)

Yes	N=3	No	N=28	Don't know	N=0
-----	-----	----	------	------------	-----

**Requirements:** Two States said that they did not require individuals to complete a certain number of CEU's, but that successful completion of the modules helps promotion potential. One State said new employees must complete three selected modules during 1 year's probation, but the number of CEU's was not considered. Another State said it has a continuing education requirement. One other State commented that CEU's are necessary to be a higher grade inspector.

10. Do you feel additional CEU's should be awarded to people who take an NCWM module more than once?:

Yes	N=23	No	N=6	Don't know	N=2
-----	------	----	-----	------------	-----

If "no," please explain:

**Comments:** "Not unless the module has been significantly revised." "You should only earn CEU's once for each course, not each time it is taken." "Perhaps not full credit in all cases." "Time used to retake a course could be expended on another module."

If "yes," please indicate when you think additional CEU's should be given: (Circle all that apply.)

- a. When an individual retakes a course that has been substantially revised since the last time the course was taken. **N=18**
- b. When an individual retakes any course that has been revised, even if only a few changes have been made. **N=2**
- c. Anytime an individual retakes a course, whether or not the course has been revised. **N=3**
- d. Anytime an individual retakes a course after a specified period of time, whether or not the course has been revised. What period of time would you recommend?: **N=17**

**90 DAYS N=1   2 YEARS N=3   3 YEARS N=4   4 YEARS N=1   5 YEARS N=5**  
**3-4 YEARS N=1   3-5 YEARS N=1   4-5 YEARS N=1**

e. Other:

**Comments:** "If they feel CEU's are important; even an experienced W&M official needs a refresher course." "Continuing education is to learn what we don't know, whether it be from forgetting, never having the information before, or part of a learning progression." "'Updated' modules that reflect general Handbook 44 changes." "Only after NCWM Education Committee reviews it."

11. Do you think the Conference should discontinue the awarding of CEU's and instead provide some other form of recognition? (Circle your answer.)

Yes   **N=7**   No   **N=12**   Don't know   **N=12**

If "no," please explain:

**Comments:** "CEU's provide recognition for successful completion of a module. Current system is adequate." "It is good recognition of accomplishment." "Is it all that necessary to issue/track CEU's?" "CEU's are well established and recognized as units of achievement by most forms of education."

If "yes," please indicate the type of recognition would you prefer, if any:

**Comments:** "A certificate for personnel file." "NCWM or NIST certificate." "Trainer certification to inspect or test."

**Certification of Weights and Measures Officials** (Circle your answer to the following questions; feel free to add comments below any question.)

12. How would you rate the importance of NCWM certification to your weights and measures staff members?

1   2   3   4   5  
 Not important   No opinion   Very important

**OVERALL RATING: 4.1**

13. How would you rate the importance of the NCWM certification program to your weights and measures program?

1   2   3   4   5  
 Not important   No opinion   Very important

**OVERALL RATING: 4.0**

14. Do you think the NCWM should continue its certification program for weights and measures officials?

Yes   **N=29**   No   **N=0**   Don't know   **N=0**

## Education Committee

15. Do you feel the certification program could be improved? (If you answer "yes," please explain below.)

Yes      N=10                      No      N=4                      Don't know      N=17

**Comments:** "By attempting to shorten existing modules (in some cases) or allowing the training to be given one day per month; or some other such schedule." "There is always room for improvement, but I further believe we need to certify the entire Weights and Measures program. In other words, not only certify inspectors, but the entire jurisdiction." "I believe it continues to get improved." "Make it easier for individual self-study, at least department-wide self-study." "What does 'Certification' mean? Does it carry legal recognition such as registered nurse or professional engineer? If not, it needs to mean something to be of great benefit." "Monitor program so certification means the same thing in all States. Assist States who don't have someone to do certification."

### Trainer Certification (Circle your answer to the following questions; feel free to add comments after any question.)

16. Trainers who meet certain basic criteria may be certified by the NCWM as being qualified to teach NCWM training modules. How would you rate the importance of the NCWM trainer certification program?

1                      2                      3                      4                      5  
Not important                      No opinion                      Very important

OVERALL RATING: 4.0

17. Do you think the NCWM should continue its certification program for trainers?

Yes      N=23                      No      N=2                      Don't know      N=6

**Comments:** "Yes, but in somewhat of a related fashion. I see no need for the Education Committee to formally vote on the trainer's qualifications." "If economically feasible."

18. Do you think you would ever use the services of one of the certified trainers on the NCWM's Trainers List, which is made up of individuals who have volunteered to assist jurisdictions in presenting NCWM training modules?

Yes      N=24                      No      N=3                      Don't know      N=4

**Comments:** "Yes, however, I would still be concerned unless I had other information to make a decision on an individual trainer." "Cost is a major consideration."

**Part II - Future of the NTP - The following questions are intended to assess your views on the future direction of the NTP.**

19. The NCWM has received a number of suggestions for changes in NTP publications or programs. Your help is needed in putting priorities on those suggestions. Please indicate what you think the priorities for the NTP should be by ranking the following in order of priority – 1 being the highest priority:

- |               |    |             |   |
|---------------|----|-------------|---|
| <b>No. 1</b>  | b. | <b>2.03</b> | Redesign modules to eliminate duplication so that they are shorter and more efficient to present.   |
| <b>No. 2</b>  | f. | <b>2.4</b>  | Develop videos on device examinations.  |
| <b>No. 3</b>  | a. | <b>3.36</b> | Update existing modules.  |
| <b>No. 4</b>  | h. | <b>3.6</b>  | Develop field manuals that would include such information as expanded Examination Procedure Outlines, tolerance tables, and sample forms or worksheets.   |
| <b>No. 5</b>  | c. | <b>3.6</b>  | Complete the Weights and Measures Administration Module, Part II, which is an Administrative Manual for administrators and supervisors that provides in-depth information on how to organize, manage, and justify a regulatory weights and measures program.  |
| <b>No. 6</b>  | e. | <b>5.3</b>  | Develop short courses on technical subjects such as:<br>ISO 9000, checking milk, electronic components - scales and pumps, CNG - LPG, specific electronic associated equipment, load cells, UPC scanner inspection, vapor elimination test, wt. substitution. |
| <b>No. 7</b>  | g. | <b>5.8</b>  | Develop video courses on:<br>All modules; Module 8; small capacity scales and gasoline meters; Modules 2, 5, 8, 10; scales, petroleum meters, hopper scales, livestock, and truck scales; LMD's, package weighing, VTM, HD scales.                            |
| <b>No. 8</b>  | i. | <b>5.8</b>  | Develop correspondence courses on:<br>Electronics (Module 27), Handbook 44, commodity regulations; interstate W&M cooperation; scales, liquid-measuring devices; all modules.   |
| <b>No. 9</b>  | d. | <b>6.8</b>  | Develop new modules such as:<br>Taximeters; hopper scales; voluntary registration of servicemen & serv. co.; jeweler's and precious metals devices; metrication; Batch plant, belt scales; UPC; moisture meters.  |
| <b>No. 10</b> | j. | <b>7.0</b>  | Other: (please specify)<br>Two-day module instructions; alternative test procedures; develop videos on investigation of fraud and fraudulent operation of weighing/measuring devices and special inspection equipment and techniques.                         |

Education Committee

20. The NCWM has less than \$100,000 left of the grant funds provided by the National Institute of Standards and Technology for the development of new training materials. How would you like to see the NCWM spend the remaining funds? (Please list your top three priorities below. If you would like to put one of the items listed in question 19 in your list of priorities, just enter the letter of the item in the appropriate blank below.)

a. Top priority: **B (Redesign modules to eliminate duplication) N=17**

b. Second priority: **A (Update existing modules) N=12**

c. Third priority: **C (Complete W&M Administration Part II) N=12**

21. The following are different methods of delivery of training. Which methods would you prefer to use to deliver training in your jurisdiction? (Please put a "1" by your first choice, a "2" by your second choice, etc.)

a. **1.6** Classroom training with an instructor.

d. **3.2** Correspondence courses.

b. **2.6** Self-study courses (written text).

e. **4.5** Computer-based training.

c. **2.3** Self-study courses (video tapes).

f. Other: \_\_\_\_\_

**Other:** Field training with instructor; a combination video and written text; classroom training including field training with instructor.

22. Existing NTP training modules take from 2 days to 5 days to present. What do you think is the maximum amount of time that should be spent on any single training program? (Circle the letter next to your answer.)

a. 1 day or less **N=1**

d. 4 days **N=9**

b. 2 days **N=2**

e. 5 days **N=1**

c. 3 days **N=14**

f. Other: **2 or less = 1**  
**2-3 = 1**

**Other:** "Give consideration to offering training once a month, etc. once modules have been shortened as much as possible."

23. What type of assistance could your jurisdiction provide to help the NCWM in the development and maintenance of its training programs? (Circle the letter next to your answer.)

a. Update modules. **N=2**

b. Develop videos of device inspections for modules. **N=6**

c. Develop short courses. **N=3**

d. Field test modules. **N=16**

e. Other: **N=4**

f. None **N=3**



**Appendix C (contd.)**  
**Summary of the Results of the NTP Survey**  
**Of Weights and Measures Trainers**

**Total Responses: 23**

**Introduction** - The purpose of this survey is to obtain information that will help the Conference plan the future direction of the National Training Program. It begins with questions on the current program in order to assist you in assessing what you like or do not like about what is now in place. It then asks for your views on how the program could be improved so that we can better serve your training needs now and in the future.

**Part I - Current Program** - The following questions are intended to assess your views on the existing training modules and programs of the NTP.

**Modules**

1. How would you rate the overall usefulness of the NCWM Training Modules to your jurisdiction? (Circle your answer.) **N=23**

1	2	3	4	5
Not useful		No opinion		Very useful

**Overall Rating: 4.7**

**Summary of comments:** The modules are the key to uniformity. They are useful to experienced inspectors as well as new inspectors. They complement field training.

2. How does your jurisdiction use the NCWM training modules? (Circle all that apply) **N=23**

- a. As the basis for classroom or self-study training of weights and measures officials. **N=21**
- b. As reference materials for inspectors. **N=18**
- c. As models for courses developed by the jurisdiction. **N=5**
- d. Parts are copied and distributed to inspectors or the public in response to inquiries about policies or procedures. **N=10**
- e. Other (please specify):

**Summary of comments:** Periodically used as in-house refresher courses. Parts are copied for service companies. Parts are used in the exam that inspectors must pass to reach the highest inspector level. EPO's are copied and distributed to inspectors and service companies.

- f. Do not use the modules.

3. Using the table on the next page, please rate each published training module on usefulness to your jurisdiction (how well it meets your jurisdiction's needs for training in the subject area), adequacy of content, and appropriateness of length? (Check the appropriate box in the table to indicate your rating. If you are not familiar with a particular module or a certain aspect of the module, leave the appropriate box blank.)
4. What do you like best about the modules? **N=21**

**Summary of comments:** The modules provide formal training that is uniform, comprehensive, flexible, and easily understood. The Handbook 44 references are useful and are explained in an easy to understand manner. Safety is an important part of each module. The modules cut down on the amount of preparation needed to provide training.

Module	Usefulness			Content	Length		
	not useful	useful	very useful		too extensive	about right	not enough detail
Mod 2, Retail Computing Scales		3	9	1	9	1	8
Mod 4, Medium-Capacity Scales		6	3	3	5	3	4
Mod 5, Vehicle & Axle-Load Scales		2	9	1	8	2	6
Mod 6, Meat Beams & Monorail Scales	2	2	3	1	5		3
Mod 7, Livestock & Animal Scales	1	4	3		6		5
Mod 8, Retail Motor-Fuel Dispensers		2	11		12	2	7
Mod 10, Checking the Net Contents of Packaged Goods	1	2	6	3	5	4	3
Mod 19, Loading-Rack Meters	1	4	2		4	1	3
Mod 20, Vehicle-Tank Meters	1	2	2		4		3
Mod 21, LPG Liquid-Measuring Devices		1	3		4		4
Mod 22, Commodity Regulations	2	5	2	1	4	2	4
Mod 23, Intro. to W&M Regulation	1	4	1		5		4
Mod 24, Intro. to NIST Handbook 44		7	3	1	8		7
Mod 27, Intro. to Elect. W&M Systems	1	6	1		4		5

Comments: "About right" on content & length; all depends on if you have time to prepare and present the information. In many situations (inspector's experience, ability, time and money for training) shorter courses are more appropriate. I believe the content and length are acceptable for beginning inspectors. The advanced inspectors would like more detail and a follow-up without the beginning repetition and final enforcement chapters, unless original ideas can be added to deal with enforcement issues. I think this may be possible.

5. What do you like least about the modules? **N=18**

**Summary of comments:** The modules need to be updated more regularly. They include too much duplication. They are too long. Information presented is sometimes superfluous and important points are not always adequately stressed. Inclusion of Handbook 44 references makes inspectors think they have to memorize them; we want to get used to referring to the latest Handbook. Some areas (such as tolerance worksheets) need more explanation.

6. What type of visual aids do you prefer to use when you teach a class? (Put a "1" by your first choice, a "2" by your second choice, etc.) **N=22**

No. 1	b.	1.6	Overheads	No. 4	c.	3.4	Flipcharts
No. 2	d.	2.4	Videos	No. 5	e.	3.5	Other:
No. 3	a.	2.5	Slides	Personal overheads, chalk board, demonstration equipment and materials (scales, meters, packages, etc.), actual equipment in the field.			

7. How would you rate the overall usefulness to you of the Instructor's Manuals that are supplied with NCWM Training Modules? (Circle your answer.) **N=19**

1	2	3	4	5
Not useful		No opinion		Very useful

**Overall Rating: 3.5**

**Summary of comments:** Very limited use. Some manuals were very useful and some were incomplete. You only need to read them once. Modules are taught using the Inspector's Manual

8. How do you feel the Instructor's Manual could be improved? **N=7**

**Summary of comments:** Less formality. It should follow the order of the Inspector's Manual. It should be replaced with a lesson plan to be used with the Inspector's Manual. It should include suggestions for demonstrating specific operations such as discrimination test, AZT test, air eliminator test, etc. More history and background to share, different from Inspector's Manual. Tidbits, suggestions of things to do to enhance learning and quizzes.

#### CEU's

9. The Conference now awards Continuing Education Units (CEU's) to individuals who successfully complete the classroom portion of the training modules. The CEU is a nationally recognized measure of noncredit continuing education learning experiences. How would you rate the overall importance of CEU's to the individuals who take module training in your jurisdiction: (Circle your answer.) **N=23**

1	2	3	4	5
Not important		No opinion		Very important

**Overall Rating: 3.4**

**Summary of comments:** Comments ranged from "I know of no one who has ever used them" to "In many jurisdictions - no CEU's - no attendance." Most people seemed to feel that some form of recognition is important. It was suggested that CEU's would be more valuable if jurisdictions used them for job advancement and salary increases.

10. Do you feel additional CEU's should be awarded to people who take an SCNM module more than once?

Yes N=15

No N=0

Don't know

If 'no,' please explain:

Summary of comments: Repeat courses are just that, credit should be given only once for the best results. It would depend on the time lapse between courses and revisions. Why take the same course twice, a review will serve the same purpose.

If 'yes,' please indicate when you think additional CEU's should be given. (Circle all that apply.)

- a. When an individual retakes a course that has been substantially revised since the last time the course was taken. N=15

- b. When an individual retakes any course that has been revised, even if only a few changes have been made. N=5

- c. Anytime an individual retakes a course, whether or not the course has been revised. N=0

- d. Anytime an individual retakes a course after a specified period of time, whether or not the course has been revised. What period of time would you recommend? N=11

2 Years N=6 3 Years N=2 3-5 Years N=1 5 Years N=3 5-10 Years N=1

Comments: 10 years or maybe 5 for certain modules where subject is controversial, such as package weight.

e. Other:

Summary of comments: Additional CEU's should be given anytime an individual is "transferred" to a different position (for example, from large valves to gas pumps, etc.) if the inspector may have had the module before, but since it was not his responsibility, he/she may not have given it 100%. Combination of a. and d. - individuals must meet both criteria to apply for additional CEU's.

11. Do you think the Conference should discontinue the awarding of CEU's and instead provide some other form of recognition? (Circle your answer.) N=19

Yes N=3

No N=11

Don't know N=5

If 'no,' please explain:

Summary of comments: It would depend on whether or not there is a cost involved. CEU's should be retained because they are nationally recognized. A certificate would be sufficient. The value of the CEU needs to be explained.

If 'yes,' please indicate the type of recognition would you prefer, if any.

Summary of comments: What about some minor recognition for participation and some major recognition for successful completion of final exam. Instead of giving CEU's to someone retaking a course, why not establish a requalification program.

**Certification of Weights and Measures Officials** (Circle your answer to the following questions; feel free to add comments below any question.)

12. How would you rate the importance of NCWM certification to individuals in your jurisdiction? **N=19**

1	2	3	4	5
Not important		No opinion		Very important

**Overall Rating: 4.0**

**Summary of comments:** It is important to me and the inspectors - evidently low priority on the State and administrative levels. We frame the certificates and present them formally. From what I hear, the cities would like the State to be more active in certifying their programs and persons involved in weights and measures.

13. How would you rate the importance of the NCWM certification program to your weights and measures program? **N=19**

1	2	3	4	5
Not important		No opinion		Very important

**Overall Rating: 4.2**

**Summary of comments:** Would like to see mandatory certification. In my State it is a requirement for advancement in grade. The guidance and certification should be there to foster uniformity amongst the States. It adds credibility to the program and prevents its demise and privatization.

14. Do you think the NCWM should continue its certification program for weights and measures officials? **N=19**

Yes <b>N=17</b>	No	Don't know <b>N=2</b>
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15. Do you feel the certification program could be improved? (If you answer "yes," please explain below.) **N=12**

Yes <b>N=8</b>	No <b>N=2</b>	Don't know <b>N=2</b>
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**Summary of comments:** Would like to see NCWM adopt mandatory certification and the certifying officer should be a "certified trainer" within the regional association pertinent to the person being certified. To certify inspectors just because they passed a module is not enough. There needs to be continual monitoring on annual or semi-annual basis of inspector. If the inspector leaves current job or job category for a number of years, then comes back to old job, is he still certified? Need to have annual evaluation updates to maintain certification. Certify State programs, not just training. More recognition of benefits is needed. The program needs to be "sold" to jurisdictions and individuals. Experienced inspectors should be permitted to self-study any module and take the exam; field evaluation must follow. After major revisions require re-certification. I think the work group on privatization should change its name and work with education, or other appropriate parties, to develop further enhancements to requiring certification.

**Trainer Certification** (Circle your answer to the following questions; feel free to add comments after any question.)

16. Trainers who meet certain basic criteria may be certified by the NCWM as being qualified to teach NCWM training modules. How would you rate the importance of the NCWM trainer certification program? **N=19**

1	2	3	4	5
Not important		No opinion		Very important

**Overall Rating: 4.4**



17. Do you think the NCWM should continue its certification program for trainers? **N=19**

Yes **N=16**

No **N=2**

Don't know **N=1**

18. Have you applied for certification or do you plan to apply for certification in the future? (If you answer "No," please explain why below.)  
**N=18**

Yes **N=13**

No **N=3**

Don't know **N=2**

**Part II - Future of the NTP - The following questions are intended to assess your views on the future direction of the NTP.**

19. The NCWM has received a number of suggestions for changes in NTP publications or programs. Your help is needed in putting priorities on those suggestions. Please indicate what you think the priorities for the NTP should be by ranking the following in order of priority - 1 being the highest priority: **N=19**

a. **2.9** Update existing modules. **N=18**

b. **2.3** Redesign modules to eliminate duplication so that they are shorter and more efficient to present. **N=19**

c. **4.0** Complete the Weights and Measures Administration Module, Part II, which is an Administrative Manual for administrators and supervisors that provides in-depth information on how to organize, manage, and justify a regulatory weights and measures program. **N=15**

d. **4.1** Develop new modules such as: **N=8**

**Summary of comments:** Mass flow meters, testing taxi meters, hoppers and auto bulkweighing systems, grain test equipment, petroleum product sampling.

e. **4.8** Develop short courses on technical subjects such as: **N=3**

**Summary of comments:** Statistics; safety in the field; individual testing procedures or equipment; new technology which has been introduced into the marketplace but not addressed by NCWM; NTEP; package inspection of aerosols, count, etc.; load cells/scale electronics; the existing modules; tolerance applications, testing procedures; scanner testing; CNG.

f. **4.0** Develop videos on device examinations to supplement the modules. **N=16**

g. **4.6** Develop video courses on: **N=9**

**Summary of comments:** Vehicle scale inspections and HB 133 package inspections; field safety procedures; testing of livestock, truck, and hopper scales; all modules; explaining the changes to HBs 44, 130, 133.

h. **3.6** Develop field manuals that would include such information as expanded Examination Procedure Outlines, tolerance tables, and sample forms or worksheets. **N=16**

i. **4.7** Develop correspondence courses on: **4.7**

**Summary of comments:** All modules; NCWM amendments (annually); gasoline station testing/store scale testing; for service agencies; Modules 22, 23, 24, and 27; history of weights and measures past, present, now.

j. **7.0** Other: (please specify) **N=4**

**Summary of comments:** Develop a procedural manual to cover all device testing and package weighing. Develop modules designated "beginner," "intermediate," and "advanced," that are designed so they are readily modifiable for each of the designated groups. Develop computer training courses. Hire additional persons to work with the education committee and State directors in developing, reviewing, certifying and setting goals and standards in weights and measures programs -- they should have a travel budget to be able to visit the States and evaluate current programs and make suggestions, work with trainers on doing training, but not do official training themselves. Maintain Module 6 as an active module!

20. The NCWM has less than \$100,000 left of the grant funds provided by the National Institute of Standards and Technology for the development of new modules or module revisions. How would you like to see the NCWM spend the remaining funds? (Please list your top three priorities below. If you would like to put one of the items listed in question 14 in your list of priorities, just enter the letter of the item in the appropriate blank below) **N=19**

a. Top priority:

**A (Update existing modules) N=4**

**C (Complete W&M Administration Part II) N=4**

**B (Redesign modules to eliminate duplication) N=3**

**F (Develop videos on device examinations) N=1**

b. Second priority:

**H (Develop field manuals) N=6**

**A N=2**

**B N=2**

**C N=1**

**E N=1**

**I N=1**

c. Third priority:

**C N=3**

**F N=3**

**A N=1**

**H N=1**

**J N=1**

21. The following are different methods of delivery of training. Which methods would you prefer to use to deliver training in your jurisdiction? (Please put a "1" by your first choice, a "2" by your second choice, etc.) **N=21**

a. 1.1 Classroom training with an instructor. **N=19**

d. 3.7 Computer-based training.  
**N=14**

b. 2.7 Self-study courses. **N=17**

e. 2.3 Other:

c. 2.8 Correspondence courses. **N=15**

**Comments: Field training**

22. Existing NTP training modules take from 2 days to 5 days to present. What do you think is the maximum amount of time that should be spent on any single training program? (Circle the letter next to your answer.) **N=18**

a. 1 day or less

d. 4 days **N=4**

b. 2 days **N=2**

e. 5 days **N=4**

c. 3 days **N=7**

f. Other: 2-4 Days **N=1**

23. What suggestions do you have for improving the NCWM training modules or the services of the National Training Program? N=9

**Comments:**

Appoint a national trainer "cheer leader" with direct monthly contact with State jurisdictions, long range combined-jurisdiction training events (combining expenses and benefits), develop more modern instructional techniques, methods, content, and equipment.

Need to have more follow-up to the field training. I think it would be a good idea to have field audit problems as part of the certification process assigned to the inspectors. This could either be at the end of modules or on annual basis. This could be similar to lab problems that are part of the metrology training.

The problems would have to be evaluated by someone at NIST or the Education Committee for correctness.

Develop checkoff lists, in more detail, for the instructors. I believe it is imperative for us to have a better means of checks and balances to maintain the integrity of the NTP. Have several people who can periodically audit a State or local jurisdiction's training program. (Either within the regional association or NCWM.)

More direct communication with students who have recently completed a module.

Develop videos.

Streamline modules so they are easier to update. Identify trainers in the States and use them as resources for updates, info, etc. Assist States with training program and trainer development.

The slides of equipment need updating. Field examination can be difficult to arrange and could be substituted with classroom slides, video, or (better) simulator equipment.

I think we need to get help from States that are willing to lead in education and training. With funds running out, we need to develop some revenue sources to continue the work that was begun. I believe a small tax on vehicle fuels should be established, and the funds collected should be given to NCWM for use in maintaining training of inspectors nationwide.

## **Appendix D - Proposal to Restructure the NTP's Training on Scales**

**Objective:** To make the National Training Program's training on the examination of various types of scales more efficient to present by eliminating duplication of information, to reduce classroom time by making greater use of self-study programs, and to simplify the updating process for the training materials by limiting the reprints of Handbook 44 requirements.

**Components:** The components of the restructured program would be as follows:

### **1. Existing Module 24, Introduction to NIST Handbook 44**

- Self-study module
- Provides an introduction to the training program, describes the format and content of Handbook 44, explains the requirements in the General Code, and covers the basic principles behind the establishment of tolerances
- Requirements of the General Code would be reprinted in this module, but not reprinted in the specific device training programs
- Completion of this course would be made a prerequisite to taking any other NTP training on devices

### **2. New Module on the Scales Code in Handbook 44**

- Self-study module
- Would provide an introduction to the Scales Code and explain the basic principles behind the various requirements
- Would explain the tolerance structure in the Scales Code and possibly introduce the concept of tolerance worksheets; it would also provide a detailed description of the marking requirements
- Requirements of the Scales Code would be reprinted in this module, but not reprinted in the specific device training programs
- Completion of this course would be made a prerequisite to taking any of the specific scales training programs

### **3. Revised Training Programs on Specific Types of Scales or Classes of Scales**

- Classroom training with an instructor
- Would describe how to conduct an official examination of particular types of scales (such as retail computing scales, livestock and animal scales, vehicle and axle-load scales, etc.) or a class of scales (Class III scales, Class III L scales, etc.)
- Would include one or more examination procedure outlines
- Would include hands-on practice of testing procedures
- Requirements of the General and Scales Codes of Handbook 44 would be referenced in these programs but would not be reprinted; Handbook 44 could be used to look up exact wording of requirements if necessary
- Completion of tolerance worksheets and report forms for the specific scales covered by the module will be part of the training program
- Training could be supplemented with videos of inspection and test procedures
- Student's manual could be structured as a field manual for use after the class

**Cost:** Deliverables and Estimated costs are:

- New Scales Code Module - \$28,000
- Revised Device Modules - \$22,000 per module (3 to 5 modules needed)
- Minor revision to Module 24 - No contractor cost - Revision to be done by OWM

## Appendix E - Letter from IACET on the Awarding of Additional CEU's



THE UNIVERSITY OF NORTH CAROLINA  
AT  
CHAPEL HILL

Division of External Affairs and  
Community Health Service  
School of Public Health

The University of North Carolina at Chapel Hill  
CB# 7400, Rosenau Hall  
Chapel Hill, N.C. 27599-7400

October 19, 1993

Ms. Joan A. Koenig  
NIST  
Office of Weights and Measures  
Gaithersburg, MD 20899

Dear Joan:

Recently you requested a clarification from the International Association for Continuing Education and Training regarding the practice of awarding CEUs to individuals taking a course more than one time. It is IACET's position that CEUs should only be awarded when the IACET criteria and guidelines have been met, and that includes making sure that the participant has satisfactorily met the requirements for completing the course. When such requirements have been met, there would appear to be no reason, educationally, for the individual to repeat the course soon after taking it for the first time.

Generally speaking, IACET does not recommend awarding CEUs more than once to a participant for completing the same course. However, there are certain exceptions under which CEUs might be awarded more than once to the same individual for completing a course two or more times. The first exception occurs if the course content has changed significantly, even though the title of the course may remain the same. For example, a course entitled "Legal Update" may have its content changed quite often while retaining the same course title.

A second exception may relate to the time elapsed since the course was last taken. There are certain skills which may be needed by a participant even though they are rarely used. Thus, periodic updates may be essential, even though the content of what is taught is not new. For example, the maintenance of certain life saving skills and procedures are essential for many participants. To remain competent may require periodic updates with the same course content.



Joan Koenig  
October 19, 1993  
Page 2

In each of these two examples, it would be appropriate to offer CEUs more than once to participants repeating the course. However, as a rule, IACET does not recommend awarding CEUs more than once to a participant for completing a continuing education or training program.

I hope this adequately responds to the question you raised. Thank you for bringing this matter to our attention.

If you have further questions regarding the awarding of CEUs, please contact the IACET national office in Washington, D.C. (202-842-4668) or feel free to call me directly at (919-966-3309). You may also wish to review a copy of the IACET's new *CEU Criteria and Guidelines*. Please call the IACET office to order a copy of this publication if you do not already have it.

Warm regards.

Sincerely,



Richard M. House, MPH, EdD  
Chair, IACET CEU Committee

/kg

cc: Grover Andrews, President IACET  
CEU Committee Members  
Carolyn Freeland, Executive Director

## **Appendix F - Request for Resources to Complete and Maintain Module 23, Part II**

The NCWM Committee on Education, Administration, and Consumer Affairs (Education Committee) hereby requests **\$60,000** (approximately \$5,000 per chapter) to complete the remaining 12 chapters of Module 23, Part II, Weights and Measures Administration. In addition, following the completion of the module, the Committee requests **\$10,000 per year** to ensure upkeep of the module (including the addition of new chapters and the updating of existing chapters). The Education Committee requests these additional funds for the training program because the remaining grant funds from NIST are insufficient to both develop the module and ensure adequate maintenance, which is essential to ensure the usefulness of the module.

We propose to develop three chapters a year for 4 years; therefore, the annual expense to the Conference is estimated to be approximately \$15,000 per year for 4 years and then \$10,000 per year thereafter for maintenance.

### **Background**

Early in the development of the National Training Program of the National Conference on Weights and Measures (NCWM), the Education Committee identified a need to publish a training manual for weights and measures administrators that would describe how to establish and maintain a successful weights and measures program. The model for the training program was National Bureau of Standards (now the National Institute of Standards and Technology - NIST) Handbook 82, Weights and Measures Administration, which was last issued in 1962. Handbook 82 was a comprehensive manual that covered the history, organization, and administration of weights and measures programs in the United States. It had served as a very useful document for new and experienced weights and measures officials, but was significantly out of date by the time the NTP was established.

In 1984, the NCWM contracted with a training development organization to prepare a training module on the basics of weights and measures administration. This project was one of three training programs included in the first contract (not counting an earlier contract that had been canceled) issued by the NCWM after receiving a grant from NIST for the development of training materials for weights and measures officials. Two drafts of the proposed module on weights and measures administration were prepared, but the module was never published because it had become clear that the contractor was not knowledgeable enough about current administrative practices in weights and measures jurisdictions to write the kind of up-to-date, comprehensive, substantive module that was needed.

The next attempt to complete development of the module involved assigning chapters from the contractor's last draft to staff in the NIST Office of Weights and Measures to review, correct, and update. However, the loss of experienced staff and heavy work loads in other areas resulted in the cancellation of the project and a decision to try to find another outside contractor (or contractors) to continue work on the module.

The Education Committee assessed the initial efforts to develop the administrative module and decided that the project might have a greater chance of succeeding if it was broken up into more manageable pieces. Members of the Committee identified parts of the module that should be written, or at least drafted by, one or more individuals with extensive experience in or knowledge of regulatory weights and measures activities. They felt that other parts of the module could be written by training specialists with little or no background in weights and measures because of the general nature of the subject matter and the existence of sufficient written background material on the subjects. The Committee then divided the proposed module into two parts: Part I on the history, organization, and role of weights and measures programs that could serve as an introduction to regulatory weights and measures activities in the United States and Part II that would be in the form of an administrative manual and would provide comprehensive information on how to plan, develop, and maintain a regulatory weights and measures program.

Part I was intended to be used by anyone who wanted to become more knowledgeable about the weights and measures system in the United States; it was designed to contain those portions of the module that the Committee felt could be written by training specialists with the help of written background material provided by the NCWM. Part II was intended to be used by weights and measures administrators and supervisors; it was designed to contain the specific "how-to"

information that had to be obtained directly from weights and measures professionals. Detailed outlines of the contents of Parts I and II were prepared by the Education Committee during a special meeting in 1990 (see Attachment A for the outline of Part II).

Once the project was separated into smaller parts, there was progress on the administrative module (which had been designated Module 23). A State metrologist volunteered to develop the Chapter on Metrology in Part II of Module 23; he worked with the State Metrologist's Group and OWM staff to complete a draft of the Metrology Chapter. About the same time, the Education Committee's Technical Advisor attended a seminar on the development of administrative manuals. Using information from the seminar as a guide, she designed an administrative manual format for Part II of Module 23 (see Attachment B for an example of the format). The Metrology Chapter was put into the new format and a draft was distributed at the NCWM Annual Meeting in 1992.

Negotiations were started with a retired State weights and measures director to complete the remaining portions of Part II of the module. When these negotiations failed because of the retired official's health problems, volunteers were sought from the weights and measures community to write chapters of Part II of the module. No volunteers were found; however, a member of the Education Committee who was retiring from his government position, offered his services as a contractor. After he retired, the Committee contracted with him to complete Module 23, Part II. He finished two chapters of the Module, but then asked the Committee to cancel his contract because of other commitments.

In 1992, the NCWM contracted with a training development organization to write Part I of Module 23. The module was designed as a self-study course that could be used by weights and measures office staff, inspectors, and administrators to gain a better understanding of regulatory weights and measures activities in the United States. Part I of Module 23 was published in 1993.

## Current Status of Project

As noted above, three chapters of Module 23, Part II have been completed. The Chapters cover functions of a weights and measures program, structure of a weights and measures program, and metrology. Approximately 12 chapters remain to be written. At present, the NCWM does not have a contractor working on Part II.

In the spring of 1993, a freelance technical writer was recommended to the Committee. The Committee contacted her and described the project. She expressed an interest in assisting the Conference in completing Part II. The Education Committee was seriously considering contracting with the technical writer to develop a chapter or two of the module to determine whether she could produce the type of material needed when the Central Weights and Measures Association (CWMA) expressed concerns about the existing training modules and requested changes in the format and scope of a number of the modules. They also asked the Committee to explore alternatives to traditional classroom training as represented by the training modules. Because of dwindling grant funds for use in developing training materials, the Committee was reluctant to launch a new project when it was not clear whether the existing training materials were meeting current and future needs. The Committee decided to go back to the NCWM membership to reassess their needs and priorities for training materials. A survey has been distributed to State Weights and Measures Directors to obtain this information. Other surveys of instructors and weights and measures inspectors are planned.

At the 1993 NCWM Annual Meeting, Education Committee members reviewed the status of Module 23, Part II, and decided that, to ensure the success of the project, a commitment was needed from the Executive Committee not only for the resources to develop the administrative manual but also for the funds to maintain it. It was felt that even if Conference members identified completion of Module 23, Part II, as their top priority in the surveys to be conducted by the Conference, the remaining grant funds from NIST would not be sufficient to both complete the module and adequately maintain it over time; therefore, the Committee agreed to go forward with this request for resources.

## Approach

If the Committee receives the requested funds, it will use them to contract with both weights and measures professionals and a technical writing specialist (or specialists). Past experience has shown that the direct involvement of the weights and measures community is critical to the success of the project; however, few jurisdictions have the resources available to volunteer free help to assist the Conference in writing chapters. The money allocated by the Conference could be used to establish small contracts with State or local jurisdictions to write complete chapters of the module or outline the technical information for the chapter, which would then be written by a writing specialist. At least one State has said that it might be able to provide a video explaining the technical information if someone else organized the information and wrote the chapter. In order to ensure consistency in format and presentation, all chapters will have to be edited by the writing specialist. In some cases, it may be possible for the writing specialist to write a complete chapter if he or she can interview weights and measures specialists by telephone to get the needed input from the weights and measures community.

The availability of the funds for writing chapters of Module 23, Part II, will be announced to all NCWM members and proposals will be requested. Any resulting proposals will have to be approved by the Education Committee. Once a proposal is approved, a contract will be written between the Conference and the individual or group submitting the proposal. If no proposals are received, the NCWM will contact recommended groups and individuals to see if they would be willing to develop a chapter as outlined by the Committee. The material prepared by the weights and measures specialists will be given to the writing specialist, who will complete the chapter as specified in a contract with the Conference.

## Appendix G

### Proposed Changes to the National Conference on Weights and Measures Uniform Administrative Procedures for Certification of Weights and Measures Officials

#### I. Purpose

These procedures provide a mechanism by which the National Conference on Weights and Measures (NCWM) may certify the competence of weights and measures officials to inspect and test weighing and measuring devices and to verify the net contents of packaged goods in accordance with the uniform laws and regulations adopted by the NCWM.

#### II. Goals

The goals of the program are twofold:

1. to encourage uniform enforcement of weights and measures laws and regulations within the NCWM member jurisdictions, and
2. to provide national recognition of weights and measures officials who successfully complete training under the NCWM's National Training Program, through issuance of an NCWM certificate and awarding of Continuing Education Units (CEU's).

#### III. Award of Certificate

A certificate will be awarded to each individual who: (1) successfully completes a National Training Program module for which certification is offered and (2) is recommended for certification by an state organization's certifying officer, who is the person designated by the organization to be responsible for its compliance with the requirements of the NCWM's certification program and to serve as the contact with the NCWM. Certificates will be awarded only to individuals in states organizations having a current Letter of Agreement with the NCWM.

The certificate will be verified by the signatures of the state official in the organization who is responsible for weights and measures enforcement and the Chairman of the NCWM.

#### IV. Letter of Agreement

States Organizations wishing to participate in the NCWM certification program must sign a "Letter of Agreement" (NCWM Form No. 7a or b) stating that they will train officials in accordance with and utilizing the NCWM's training modules and adhere to the "Uniform Administrative Procedures for Certification of Weights and Measures Officials." Signed Letters of Agreement should be sent to the Executive Secretary of the NCWM, who will have the Conference Chairman countersign the agreement. A copy will be returned to the designated state certifying officer designated by the organization.

#### V. Procedures

##### A. Responsibilities of the state certifying officer:

1. Provide training in accordance with the instructor's manual in each individual training module.



## Education Committee

2. Submit information on all individuals successfully completing NCWM training courses to the NCWM's National Training Program Registry. Upon an individual weights and measures official's successful completion of a training module for which certification is available, submit the name of the official and attest that the official has completed the required training and is fully qualified to perform the procedures within the specific module.
  3. Establish a training file on each participant to include:
    - a. schedule of training;
    - b. test scores;
    - c. evaluation of training;
    - d. letter to the NCWM Executive Secretary requesting participant's certification;
    - e. copy of certificate issued by the NCWM; and
    - f. copy of the information sent to the National Training Program Registry.
  4. Make information in the training file available to representatives of the NCWM Committee on Education, Administration, and Consumer Affairs upon request.
  5. Submit by January 15 of each year an annual report on the jurisdiction's training activities during the previous calendar year to the Committee on Education, Administration, and Consumer Affairs. The report shall include:
    - a. Attestation that all training records are current and in accordance with the "Uniform Administrative Procedures for the Certification of Weights and Measures Officials."
    - b. Attestation that training was provided in accordance with the instructor's manual for each module for which a certificate was issued.
    - c. Names and titles of individuals performing training.
    - d. Attestation that individuals holding certification with respect to an individual module have received information on any changes in the module in the previous calendar year.
    - e. Number of individuals receiving training during the past calendar year and number of individuals receiving certificates during the past year.
- B. Responsibilities of the Executive Secretary of the National Conference on Weights and Measures:
1. Issue an NCWM Certificate signed by the Conference Chairman for each weights and measures official for whom he or she receives an attestation of successful completion of a module from the participating jurisdiction's certifying officer.
  2. Maintain, in alphabetical order of participating jurisdictions, a roster to contain the name of the certifying officer for each jurisdiction and the name of each official who has received certification identifying the modules for which he/she has been certified.
  3. Submit a report to the NCWM Committee on Education, Administration, and Consumer Affairs at the interim meeting each year that lists the participating jurisdictions, the certifying officers, and the number of certificates that were issued in the previous calendar year.
- C. Responsibilities of the NCWM Committee on Education, Administration, and Consumer Affairs:
1. Review the annual reports of the certifying officers to assure compliance with these procedures.

2. Request Office of Weights and Measures staff and officers and standing committee members of the National Conference on Weights and Measures who are visiting participating jurisdictions to review files and procedures and report any variances to the Committee.
3. Instruct the Executive Secretary to remove a jurisdiction from the active list of participating jurisdictions and withhold issuance of all certificates whenever the Committee determines that the jurisdiction fails to comply with the requirements of the certification program.
4. Report annually to the NCWM on the status of the certification program.

Appendix H - Correspondence on Safety Issues



U.S. Department  
of Transportation

Research and  
Special Programs  
Administration

400 Seventh Street, S.W.  
Washington, D.C. 20590

NOV 4 1993

Mr. Carroll S. Brickenkamp  
Chief, Office of Weights and Measures  
U.S. Department of Commerce  
National Institute of Standards  
and Technology  
Gaithersburg, MD 20899

Dear Mr. Brickenkamp:

This is in response to your letter of July 9, 1993 regarding applicability of hazardous materials training requirements to State and local weights and measures officials.

A "person" is defined in § 171.8 as any legal entity that offers hazardous materials for transport "in commerce" or transports hazardous materials "in the furtherance of commerce." Hazardous materials transported by government entities in government vehicles is not considered transport "in the furtherance of commerce" under that definition. Therefore, the training requirements in 49 CFR Part 172, Subpart H would not apply to State and local weights and measures officials transporting hazardous materials in government vehicles.

You also point out that in a few cases, weights and measures jurisdictions have contracted private companies to perform some of their functions. Under these conditions, the private company employees must be trained in accordance with 49 CFR Part 172, Subpart H.

If we can be of further assistance, please feel free to contact us.

Sincerely,

A handwritten signature in dark ink, appearing to read "Delmer F. Billings".

Delmer F. Billings  
Chief, Regulations Development  
Office of Hazardous Materials Standards



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
HEALTH EFFECTS RESEARCH LABORATORY  
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF  
RESEARCH AND DEVELOPMENT

November 4, 1993

Charles Gardner, Director  
Bureau of Weights and Measures  
County of Suffolk  
North County Complex, Building 340  
Hauppauge, New York 11788

Dear Mr. Gardner:

Thank you for your letter of October 20, 1993, offering your assistance in identifying weights and measures jurisdictions that could gather information on potential health effects of motor fuels and motor fuel additives. EPA's Office of Research and Development is in the final stages of completing assessments on MTBE health effects and we are developing research plans for the future. Should a need arise to gather the kinds of information that you offered, we may be in contact with you.

When the ORD report on MTBE is completed, I will send a copy to you. Once again, thank you for your offer.

Sincerely,

A handwritten signature in dark ink, appearing to read "Timothy R. Gerrity".

Timothy R. Gerrity, Ph.D.  
Chief, Clinical Research Branch  
Human Studies Division (MD-58)

COUNTY OF SUFFOLK



ROBERT J. GAFFNEY  
SUFFOLK COUNTY EXECUTIVE

COUNTY EXECUTIVE'S OFFICE OF CITIZEN AFFAIRS  
MARY A. FALLON  
DIRECTOR

NORTH COUNTY COMPLEX, BLDG. 340  
HAUPPAUGE, N.Y. 11788  
(516) 853-4600

October 20, 1993

Timothy Gerrity, Ph.D.  
Health Effects Research Laboratory/ORD MD-50  
U.S. EPA  
Research Triangle Park, NC 27711

Dear Sir:

The National Conference on Weights and Measures (NCWM) is sponsored by the U. S. Department of Commerce's National Institute of Standards and Technology (NIST) in response to the statutory responsibility of NIST for "cooperation with the states in securing uniformity of weights and measures laws and methods of inspection." The vast majority of weights and measures regulation in the United States is the responsibility of the individual states. Part of that responsibility requires that all dispensers used for the sale of motor fuels must be inspected and tested for accuracy by weights and measures officials.

Serious concerns have been raised in the past few years concerning the deleterious effects that certain components of motor fuels (benzene, lead, etc.) have on the safety and health of those who are required to work in close contact with motor fuels.

I am the Director of Weights and Measures for Suffolk County, New York, and the Safety Liaison officer for the NCWM. As the NCWM Safety Liaison officer, I work under the guidance of the NCWM Education Committee. At our last annual meeting in July, 1993, we discussed an article that appeared in the June 1993 issue of National Petroleum News about health complaints on oxyfuels. It was mentioned that the EPA "...has undertaken a cooperative study to find out more about the health effects of burning oxygenates in gasoline."

On behalf of the NCWM, I offer our assistance in helping you find weights and measures jurisdictions that could gather information, collect evidence, or conduct tests concerning this potential problem. Also, we would like very much to be kept apprised of the



progress of the study and any results that come from it. I may be contacted through Joan Koenig at NIST, who is the Technical Advisor for the Education Committee. Her number is 301-975-4007. You may also contact me directly at 516-853-4621.

Very truly yours,

A handwritten signature in cursive script that reads "Charles Gardner". The signature is written in dark ink and is positioned above the typed name.

Charles Gardner, Director  
Bureau of Wts. & Measures



Florida Department of Agriculture & Consumer Services  
BOB CRAWFORD, Commissioner

Please Respond To:  
3125 Conner Boulevard  
Tallahassee, FL 32399-1650

August 31, 1993

Mr. Charles A. Gardner, Director  
Suffolk County Weights and Measures  
County Center North, Building 340  
Hauppauge, New York 11788

Dear Charles:

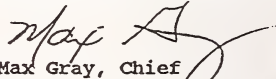
Earlier this year, we contacted our State Division of Safety concerning the use of lead in the metrology lab for adjusting and sealing weights. Since there had never been any lead exposure testing performed in the lab, the safety officials treated the situation as potentially disastrous and conducted a very thorough and comprehensive evaluation of the situation.

The final results indicated that there was not a serious problem, and through some simple housekeeping improvements the potential for exposure to lead could be minimized.

Attached is a copy of the report for use in the NCWM Safety Files. If you need any additional information, please let me know.

Sincerely,

BOB CRAWFORD  
COMMISSIONER OF AGRICULTURE

  
Max Gray, Chief  
Bureau of Weights and Measures  
904/488-9140

MG/dk

Attachment



Florida Department of Labor and Employment Security  
Division of Safety

RECEIVED

AUG 30 1993

PETROLEUM INSPECTION

Lawton Chiles  
Governor

Shirley O. Gooding  
Secretary

August 27, 1993

Ms. Nancy Fischer, Safety Coordinator  
Department of Agriculture and Consumer Services  
Division of Standards  
3125 Conner Blvd., Building 1  
Tallahassee, FL 32301

COPY

Dear Ms. Fischer:

This report provides the results of an Occupational Health Survey conducted at the Weights and Measures Laboratory on August 5, 1993. This survey was performed by State of Florida safety and health specialist Arlene Ealy and Roger Loomis.

The survey was conducted by request from Ms. Nancy Fischer, Safety Coordinator, to provide results of an ongoing Lead evaluation initiated by Division of Safety representatives. This survey addressed concerns regarding employee exposure to lead in the large mass area, shipping/receiving area, and old melting room due to the periodic punching, handling, installing and melting of lead by employees. As stated by Max Gray, Chief of Bureau of Weights and Measures, the melting operation has been discontinued. During the time of the survey there was one employee responsible for the punching operation and two employees responsible for the handling and installing of seals into weights. Air sampling was conducted at this time to determine if the requirements of the OSHA Lead Standard, 29 CFR 1910.1025, were applicable to employee lead exposures. Full-shift air samples, punch operation air samples, and additional wipe samples were taken.

**FINDINGS:** Following is a chronology of activities and results conducted in the Weights and Measures Laboratory:

1. Wipe samples were taken on April 23, 1993, to determine the presence of lead contamination throughout the laboratory. Contamination was suspected due to a lead melting and pouring operation being conducted without adequate engineering controls or personal protective equipment (PPE). Sample results ranged from 4.9micrograms(ug) to 4990ug.
2. Cleaning activities consisting of sweeping and dry cleaning were reportedly initiated to remove the contamination.

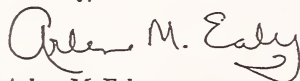
3. Wipe samples were taken on August 5, 1993, to evaluate the effectiveness of the cleaning activities. Lead sample results ranged from 14ug to 360ug of lead.
4. Personal air sampling for lead was below the 8-hour action level (AL) of 30ug/m<sup>3</sup> (microgram/cubic meter).
5. Air samples were also analyzed for aluminum because of the paint removal from 1000 lbs. weights. Aluminum was below the 8-hour 15mg/m<sup>3</sup> (milligram/cubic meter) PEL. Air sample results ranged from .01mg/m<sup>3</sup> to .02mg/m<sup>3</sup>.

RECOMMENDATIONS:

1. A written lead program is not required at this time because the employees 8-hour exposure level is below the action level 30ug/m<sup>3</sup>. Changes in future work procedures would require you to conduct additional air monitoring to assess employee exposures.
2. 29 CFR 1910.1025(h), Housekeeping requires that all surfaces be as free as practicable of accumulations of lead. Vacuuming is the preferred method of meeting this requirement, and the use of compressed air to clean floors and other surfaces is absolutely prohibited. Dry or wet sweeping, shoveling, or brushing may not be used except where vacuuming or other equally effective methods have been tried and do not work. Vacuums must be used and emptied in a manner which minimizes the reentry of lead into the workplace.
3. After each punch operation, a continuous residue clean-up practice should be instituted.

If I can be of any assistance, please call me at (904) 488-3489.

Sincerely,



Arlene M. Ealy  
Safety & Health Specialist

Enclosure

## WIPE/AIR SAMPLE RESULTS

Lab#	TYPE OF SAMPLE	LOCATION OF SAMPLE	ANALYTE OF SAMPLE	RESULTS OF SAMPLE
405541	Old Wipe Sample	Near lead punch used for sealing cast iron weights	Lead, Inorganic	4.9 ug/Samp
405542	Old Wipe Sample	Hand piece and dial of phone	Lead, Inorganic	4990 ug/Samp
405543	Old Wipe Sample	6" section of guard rail	Lead, Inorganic	67 ug/Samp
405544	Old Wipe Sample	Water Fountain	Lead, Inorganic	25 ug/Samp
405545	Old Wipe Sample	Bottom plate hydraulic punch	Lead, Inorganic	18.4 ug/Samp
405546	Old Wipe Sample	Grinder shield	Lead, Inorganic	120 ug/Samp
405547	Old Wipe Sample	Worktable with grinder	Lead, Inorganic	1100 ug/Samp
405548	Old Wipe Sample	Respirator in room with sink	Lead, Inorganic	1200 ug/Samp
405549	Old Wipe Sample	Coffee machine in room with sink	Lead, Inorganic	2340 ug/Samp
422593	New Wipe Sample	Water fountain top left front corner - Shipping/Receiving	Lead, Inorganic	45 ug/Samp
422594	New Wipe Sample	Table with bench grinder, left corner - Shipping/Receiving	Lead, Inorganic	14 ug/Samp
422595	New Wipe Sample	Left guardrail, top front adjacent to stairs - Shipping/Receiving	Lead, Inorganic	140 ug/Samp
422596	New Wipe Sample	Loading dock, right corner - Shipping/Receiving	Lead, Inorganic	360 ug/Samp



Lab#	TYPE OF SAMPLE	LOCATION OF SAMPLE	ANALYTE OF SAMPLE	RESULTS OF SAMPLE
422597	New Wipe Sample	Center workbench top under telephone - Shipping/Receiving	Lead, Inorganic	21 ug/Samp
422598	New Wipe Sample	Rear right corner workbench by exit door - Shipping/Receiving	Lead, Inorganic	13 ug/Samp
422599	New Wipe Sample	Center of workbench next to bench grinder - Preparation Room	Lead, Inorganic	330 ug/Samp
422600	New Wipe Sample	Right side of sink area - Old Smelting Room	Lead, Inorganic	87 ug/Samp
422601	New Wipe Sample	Table prep right corner - Large Mass Area	Lead, Inorganic	260 ug/Samp
422588	Air Sample	Punch operation, paint removal operation - Shipping/Receiving	Aluminum Lead, Inorganic	.02 mg/m <sup>3</sup> * 8.6 ug/m <sup>3</sup> *
422590	Air Sample	Punch operation - Shipping/Receiving, Dock Area	Aluminum Lead, Inorganic	.02 mg/m <sup>3</sup> * 10 ug/m <sup>3</sup> *
422591	Air Sample	Handling and installing seals into weights, paint removal - Large Mass Area	Aluminum Lead, Inorganic	.01 mg/m <sup>3</sup> * 8.0 ug/m <sup>3</sup> *

\* Permissible Exposure Limit(PEL)

Aluminum 15mg/m<sup>3</sup>

Lead 50ug/m<sup>3</sup>

## Appendix I

### Draft of Proposals to L&R and S&T Committees Concerning Enforcement Actions (Agenda Item 403-1)

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#### Proposals for L&R Committee:

*Proposal #1:* Amend Section 1.1 of the Uniform Weights and Measures Law (UWML) to specify that weights and/or measures, as used in this law, are those that are used commercially and those that are used for law enforcement, and add the definition for "commercial weighing and measuring equipment" that is given in paragraph G-A.1. of the General Code in NIST Handbook 44:

1.1. Weight(s) and (or) Measure(s). -- The term "weight(s) and (or) measure(s)" means all commercial weighing and measuring equipment, including weights and measures of every kind, instruments and devices for weighing and measuring, and any appliance and accessories associated with any or all such instruments and devices, and weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.

1.13. Commercial Weighing and Measuring Equipment. -- The term "commercial weighing and measuring equipment" means weights and measures and weighing and measuring devices commercially used or employed in establishing the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award, or in computing any basic charge or payment for services rendered on the basis of weight or measure.

*Justification:* As currently worded, the definition of weights and/or measures includes all weights and measures of every kind, including such devices as measuring cups, bathroom scales, carpenter's tapes, wristwatches, etc. Weights and Measures officials are aware of the intent of the definition and the law, but some non-weights and measures people (such as auditors and lawyers) have different interpretations resulting in confusion and problems.

*Proposal #2:* Amend Section 12, paragraph (i) of the UWML to make it clear that the director has the authority, but is not required, to inspect weights and measures kept, offered, or exposed for sale:

#### Section 12. Powers and Duties of the Director

##### The director shall:

- (i) Have the authority to inspect and test weights and measures kept, offered, or exposed for sale.

*Justification:* The current wording, as interpreted by potentially influential non-weights and measures officials, places a burden and responsibility on the director to inspect weights and measures kept, offered, or exposed for sale. In most cases, workload demands prevent any inspection or testing of devices that are kept for sale until they are sold and installed in a commercial application. Also, much of the inspection portion of the examination of a device kept or exposed for sale would generally be wasted effort anyway since the final installation is often critical to a device's correctness and performance. Additionally, it is all but impossible to test many devices kept or offered for sale, such as livestock and vehicle scales and many liquid-measuring devices, without incurring the expense of installing them.

*Proposal #3:* Amend Section 12, paragraph (l) of the UWML to more accurately reflect the enforcement actions taken by most jurisdictions today:

## Section 12. Powers and Duties of the Director

The director shall:

(l) Approve for use, and may mark, such weights and measures as are found to be correct, and shall reject and order to be corrected, replaced, or removed ~~and mark as rejected~~ such weights and measures as are found to be incorrect. Weights and measures that have been rejected may be seized if not corrected within the time specified or if used or disposed of in a manner not specifically authorized. The director shall remove from service ~~condemn~~ and may seize the weights and measures found to be incorrect that are not capable of being made correct.

*Justification:* The only definition of "reject" found in NCWM documents appears in Section 5.2 of the Fundamental Considerations Appendix in Handbook 44. That section states that if the official finds a device "that does not conform to all official requirements, he is required to reject it and prohibit its use until the device is brought into proper conformance."

A survey of weights and measures officials indicates that when most jurisdictions find a device that fails to meet certain official requirements (such as marking requirements; access for testing; or even small out of tolerance errors, especially those in favor of the customer) they allow a reasonable amount of time for the owner to bring the device into conformance before prohibiting its use and possibly putting the owner out of business.

The survey also indicated that many jurisdictions have different definitions of "condemn," many of which conflict with the implied definition of "condemned" found in sections 6 and 7 of Fundamental Considerations, that is, "permanently out of service." Replacing the word "condemned" with "remove from service" allows for flexibility in a jurisdiction's actions and use of terminology.

---

Recommendations for the S&T Committee related to the above L&R proposals:

*Proposal:* Rewrite, or amend, sections 5.2., 6.1., and 7.1. of the Fundamental Considerations (Appendix A) in Handbook 44 to more accurately reflect actual enforcement actions in most jurisdictions, provide flexibility in establishing jurisdictional enforcement policies, and bring material into agreement with the above L&R proposals. The following is a preliminary draft that can be considered:

### 5. Correction of Commercial Equipment

**5.2. When Corrections Should be Made.** - ~~The One of the primary duties of a weights and measures official has one official duty,~~ is to determine that equipment is or is not suitable for commercial use. If a device conforms to all legal requirements, the official "marks" or "seals" it to indicate approval. If it does not conform to all official requirements, the official he is required to reject it and prohibit its use until take action that will assure that the device is brought into proper conformance, corrected within a reasonable period of time. Devices that have performance errors resulting in possible serious economic injury to either party in a transaction should be prohibited from use immediately and not allowed to return to service until necessary corrections are made. The official should consider all information available in determining the most appropriate action, including (but not limited to) the costs of commodities measured on the device, the frequency of use, and the overall impact of the immediate enforcement action.

Some officials contend that it is justifiable for the official to make minor corrections and adjustments if there is no service agency nearby or if the owner or operator depends on this single device and would be "out of business" during the repair of ~~if the use of the device was prohibited until repairs could be made.~~

Before adjustments are made at the request of the owner or his or her representative, the official should be confident that the problem is not due to faulty installation or a defective part, and that the adjustment will correct the problem. ~~He~~ The official should never undertake major repairs, or even minor corrections, if services of commercial agencies are readily available. The official should always be mindful of conflicts of interest before attempting to perform any services outside the normal device examination and testing duties.

## 6. Rejection of Commercial Equipment

**6.1. Rejection and Condemnation.** - The uniform Weights and Measures Law contains a provision stating that the director shall reject and ~~mark rejected~~ order to be corrected such weights and measures ~~as he finds~~ found to be incorrect. Weights and measures that have been rejected may be seized if not corrected within a reasonable time or if used or disposed of in a manner not specifically authorized. The director shall ~~condemn~~ remove from service and may seize weights and measures found to be incorrect that are not capable of being made correct.

(No change to the remaining portion of Section 6.1)

## 7. Tagging of Equipment

**7.1. Rejected and Condemned.** - It will ordinarily be practicable to tag or mark as rejected each item of equipment found to be incorrect and considered susceptible of proper reconditioning. ~~and this should always be done unless the repairs are to begin immediately.~~ However, it can be considered justifiable to not mark as rejected incorrect devices capable of meeting acceptable performance requirements that have been allowed to remain in service for a reasonable time until minor problems are corrected since marks of rejection may tend to be misleading about a device's ability to produce accurate measurements during the correction period. ~~†The tagging of equipment as condemned or with a similar label~~ to indicate that it is permanently out of service is not recommended if there is any other way in which the equipment can definitely be put out of service. Equipment that cannot successfully be repaired should be dismantled, removed from the premises, or confiscated by the official rather than merely being tagged as "condemned."

*Justification (for changes to Fundamental Considerations):* Some of the changes are to reflect proposed changes to the UWML, which uses the terms "reject," "condemn," and "mark as rejected" without defining them. These sections of the Fundamental Considerations are where these terms are described or defined. Most jurisdictions use these terms, but there is little uniformity as to their meaning or the policies containing them. Also, there is little interest in developing standard, uniform definitions of these for various reasons.

Flexibility in the definitions and enforcement policies is needed because of the great number of Handbook requirements that have little or no effect on the actual ability to accurately measure (i.e., marking requirements). Weights and Measures programs, as with most government programs, are under closer scrutiny than ever before by the political bodies that authorize them. Rigid policies that immediately remove devices from service and possibly put customers out of business for failure to meet minor requirements are often considered unreasonable by lawmakers. Assuring equity in the marketplace can be accomplished while still allowing reasonable flexibility in enforcement actions.



**Appendix J**  
**Report on the Special Meeting of the NCWM**  
**Committee on Education, Administration, and Consumer Affairs**  
**In Tallahassee, FL, April 8-10, 1994**

At the NCWM Interim Meeting in January 1994, the Executive Committee asked the Committee on Education, Administration, and Consumer Affairs (CEA&CA) to hold a special meeting to discuss an expansion and redirection of the CEA&CA's responsibilities as a result of the disbanding of the NCWM Liaison Committee and changes in the priorities of the Conference. CEA&CA was requested to review all areas of responsibility that had been assigned to it under the NCWM Bylaws, with particular attention to the areas of administration and public outreach programs, and to develop a management plan for accomplishing its highest priorities.

The meeting of the CEA&CA took place in Tallahassee, FL, on April 8 to 10. The following individuals took part in the meeting:

**Education Committee Members:** James Harnett, Orange County, CA, Chairman; Maxwell Gray, FL; Barbara DeSalvo, OH; Edwin Price, TX; Bruce Martell, VT; Joan Koenig, Technical Advisor

**Executive Committee Members:** Thomas Geiler, NCWM Chairman and Chairman of the NCWM Privatization Work Group; Darrell Guensler, former NCWM Chairman and Chairman of the NCWM Task Force on Planning for the 21st Century; Carroll Brickenkamp, Chief of the NIST Office of Weights and Measures and NCWM Executive Secretary

**Associate Membership Committee Members:** Christopher Guay, Procter & Gamble Co., Chairman; Richard Davis, James River Corp., Member of the NCWM Liaison Committee

The meeting began with a presentation by Carroll Brickenkamp, who provided some background on the mission of the Committee and described the four areas of responsibility assigned to the CEA&CA:

- a. education and training of weights and measures officials,
- b. promotion of weights and measures principles and techniques among the general public and the users of weighing and measuring devices,
- c. development and recommendation of administrative procedures and public relations programs, and
- d. identification of commercial weights and measures practices and problems that are of concern to consumers.

In addition, she noted that the Executive Committee is proposing that the following responsibility be added to the Bylaws for all Standing Committees:

liaison with Federal agencies, State agencies, and other groups or organizations on issues within the purview of the Committee. This role entails explaining, advocacy, and coordinating Conference 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.

Dr. Brickenkamp's presentation was followed by remarks from the other representatives of the Executive Committee and those from the Associate Membership Committee on the current and future needs of the NCWM in the CEA&CA's areas of responsibility. The representatives described a need for the Conference to develop outreach programs for consumers, trade associations, device users, and State legislatures. They also noted a need for an emphasis on building and maintaining quality weights and measures programs at the State and local level. In addition, it was suggested that the Committee delegate responsibility for development and maintenance of the training modules to work groups so that it will have more time to focus on other areas of responsibility. The establishment of more partnerships with industry in all areas of the Committee's responsibility was also recommended.



A discussion on the need to update the scope and objectives of the Committee in light of the current needs of the Conference resulted in the following recommendations that will be forwarded to the Executive Committee for consideration at the 1995 Interim Meeting:

**Proposed New Name of Committee: Administration and Public Affairs**

**\*\***

**Draft Mission Statement:**

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

- effective program management,
- education, and
- public relations.

**\*\***

**Proposed Revision of Committee Scope in the NCWM Bylaws:**

The Committee on Administration and Public Affairs annually presents a report for Conference action. Its scope embraces all matters dealing with:

1. development and recommendation of administrative procedures;
2. education and training of weights and measures officials;
3. promotion of weights and measures principles and techniques among users of weights and measures devices and the general public; 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 Conference 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.

The proposed modifications are not intended to represent a major change in the scope of CEA&CA; instead, they reflect a shift in focus away from module maintenance and development to the broader area of administration and from consumer affairs to the wider sphere of public affairs. Education will continue to be an important part of the Committee's mission; however, other areas that were put aside while the Committee concentrated on the development of the National Training Program will now be given more attention.

The CEA&CA's Technical Advisor, Joan Koenig, made a presentation on a series of matrices that had been developed representing the Committee's four current areas of responsibility. For each area, the matrix listed a series of possible projects and activities that could be undertaken by the CEA&CA. The meeting participants discussed the relative importance and feasibility of the various items. They then put priorities on each project and activity and regrouped them under headings representing the responsibilities in the proposed revision to the Committee's scope. The results are shown in Figure 1.

<p><b>Objective: Development &amp; Recommendation of Administrative Procedures</b></p> <p>1 - Prioritize administrative issues</p> <p>2 - Select one or more administrative themes per year and establish a working group to study the issue and prepare a report</p> <p>3 - Develop chapter for Administrative Manual</p> <p>4 - Develop a set of standards for w&amp;m programs</p>
<p><b>Objective: Education &amp; Training of W&amp;M Officials</b></p> <p>1 - Enhance the training delivery system</p> <p>2 - Redesign/update the existing training modules</p> <p>3 - Develop other types of training products (e.g., video courses, field manuals, executive training)</p> <p>4 - Develop training programs for servicepersons</p> <p>5 - Develop new modules</p>
<p><b>Objective: Promote W&amp;M Principles and Techniques</b></p> <p>1 - Develop background materials for specific groups (e.g., legislators, media)</p> <p>2 - Prepare model news releases and articles</p> <p>3 - Attend/participate in/sponsor conferences for industry</p>

**Figure 1. Committee Objectives and Priorities**

In setting priorities in the area of education and training, the Committee took into account the results of the recent survey it had conducted on the future direction of the National Training Program. The Committee did not identify specific priorities under the objective dealing with liaison because it was felt that the liaison objective was not actually separate and distinct from the other objectives, but rather it was an essential factor in achieving the other objectives.

After listing priorities, the CEA&CA began identifying tasks and developing an action plan to accomplish those tasks. The initial part of the plan covered tasks that the Committee wanted to undertake prior to the NCWM Annual Meeting in July.

One of the first actions was to select an administrative issue to be addressed by an NCWM Working Group over the next year. The meeting participants agreed that an issue of great importance to the weights and measures community is "Program Evaluation." The need for pursuing this topic had been identified by the Privatization Work Group. They recommended that the Conference explore what needs to be collected in the future by any weights and measures jurisdiction to help in establishing priorities and measuring effectiveness. The Program Evaluation Work Group will be asked to build on the work done by the Privatization Work Group and establish the foundation for a national weights and measures information network.

To initiate the work group and get started on some additional key objectives prior to the Annual Meeting, the following tasks were identified:

- Develop a mission statement, scope, and objectives for the Program Evaluation Work Group and identify possible candidates to participate in the project
- Formally request the establishment of the work group
- Arrange for publicity for key issues to be discussed or decided at the NCWM Annual Meeting.
- Begin interviewing State officials to determine their training delivery problems and needs and what they are doing in the area of public outreach
- Develop a report of the special meeting and include recommendations to the Executive Committee for changes in the name and scope of the Committee as well as a new mission statement to be included in the NCWM Bylaws

At the Annual Meeting, the Committee will proceed with the development of its work plan. Expansion and updating of the work plan will be a continuing process.

The Committee believes its role is to provide leadership and direction in the areas within the scope of its responsibilities, but it will be up to weights and measures jurisdictions to use the administrative guidance, training materials, and public relations materials produced under the Committee's direction in order to achieve the NCWM's goals. Regional weights and measures associations and individual States should look at the proposed changes to the Committee to assess what these changes mean to them. For example, promoting weights and measures principles and techniques should be a concern of all NCWM members. The development of articles for the media, developing briefing papers for businesses or for State legislatures, and attendance at or participation in industry conferences are activities that all NCWM members can take part in to spread the word about Conference programs and policies.

## Metrology Report

The 1994 NCWM Metrology meeting included reports from all of the regional metrology groups that have met during the past year. A thorough review of past and present metrology projects was conducted and all possible current projects are described here. Working sessions were held to review the draft NIST Handbook 143 and a new document that will address the measurement control needed for advanced weighing designs. A number of additional presentations were made, including one by Al Tholen on "NVLAP Accreditation of the State Laboratories" and one by Dr. Lev Issaev on "Metrology in Russia."

### Regional Group Reports

#### **NEMAP: Mike Dynia (CT)**

Last meeting: September 27 - October 1, 1993.

This was one of the largest NEMAP meetings, with 23 attendees, and included Dave Morgan (LMB, Canada). It was hosted by Ohaus Corporation, in Florham Park, NJ. Rhode Island was the only State not represented. Additional participants included metrologists from Ohaus, Wyeth-Ayerst, Troemner.

Current round robins:

- 1) two 50-lb weights previously used in MidMAP;
- 2) one 5-gal test measure; and
- 3) one 100-g weight kit used in SWAP last year.

Randy Cresser (Ohaus) is doing an excellent job of coordinating the round robin schedules and keeping them on track by using formal project planning and control software. Mike Dynia (CT) is the NEMAP statistical analyst and has enlisted the support of additional NEMAP members to act as assistants to handle collection of data and analysis of results. Peter Millvan (PA) will assist with item number 1, Ray Cioffi (VT) will assist with item number 2, and Ron Balaze (MI) will assist with item number 3.

The 1993 topics included the following:

- Mike Dynia (CT): Overview of ISO 9000 Task Force Committee report, review of Technical Criteria for accreditation of mass and volume laboratories;
- Peter Millvan (PA): Gap Analysis;
- Georgia Harris (NIST): Ensuring Accuracy and Traceability of Weighing Instruments, Laboratory Accreditation, Internal Auditing, Writing and Assessing a Laboratory Quality Manual, Technical Management of the Weights and Measures Laboratory; and
- Mike Dynia (CT): Round robin analysis.

Tours: The group toured the Ohaus metrology laboratory and the manufacturing facility.

Next meeting: The next NEMAP meeting will be hosted by Ron Balaze and the Michigan Department of Agriculture in Lansing, Michigan, September 19 - 23, 1994.

#### **MIDMAP: Bob Wittenberger (MO)**

Last Meeting: August 1 - 6, 1993.

The meeting was hosted by Bob Hollis and Tom Mathews of the Iowa Department of Agriculture in Des Moines, IA. All States except Missouri were present. Additional participants included Rice Lake Weighing Systems members.

Current round robins:

- 1) one 31-lb weight kit used in SWAP last year;
- 2) one 100-g weight kit used in SWAP last year; and
- 3) special 1-kg weights including aluminum standard (used in SWAP this year).

1993 Topics:

- Georgia Harris (NIST): Ensuring Accuracy and Traceability of Weighing Instruments, Laboratory Accreditation, Internal Auditing, Writing and Assessing a Laboratory Quality Manual, Technical Management of the Weights and Measures Laboratory;
- Steve McGuire (IL): Overview of ISO 9000 Task Force Committee Report, review of Technical Criteria for accreditation of mass and volume laboratories;
- Bruce Adams (MN): Group presentations; and
- Bruce Adams (MN), Mike Pinagel (ND), and Mike Rockford (IL): Round robin analysis.

Tours: The group toured the Iowa metrology laboratory.

Next meeting: The next meeting will be held jointly with SWAP, October 10 - 14, 1994, in Kansas City, MO.

**WRAP: Joe Rothleder (CA)**

Last meeting: May 15 - 20, 1994.

The 1994 WRAP meeting was hosted by Kelly Moody and Matt Crandall of the Arizona Department of Weights and Measures in Scottsdale, AZ. All States and Los Angeles County were represented at the meeting.

Current round robins:

- 1) two 1-lb standards for:
  - a) precision comparison of avoirdupois standards
  - b) 1-kg crossover from metric standards

1994 Topics: Intermediate Metrology Seminar, plus 1994 regional topics on Control Charts and Uncertainties, and round robin analysis.

Tours: The group toured the new Arizona metrology laboratory.

Next meeting: The next meeting will be held May 14 - 19, 1995, in Cheyenne, WY.

**SWAP: Ken Fraley (OK)**

Last meeting: October 3 - 8, 1993.

The last meeting was hosted by Billy Sullivant, Charlie Kirspele, and Randy Burns of the Arkansas Bureau of Standards in Hot Springs, AR. All States were represented at the 1994 SWAP meeting. Additional participants included metrologists from Los Angeles County, Arizona, North Carolina, Missouri, and Denver Instruments.

Current round robins:

- 1) one 100-g weight kit;
- 2) special 1-kg weights including aluminum standard (also used in MidMAP this year); and
- 3) grain moisture for rice and wheat.

1993 Topics:

- Georgia Harris (NIST): Ensuring Accuracy and Traceability of Weighing Instruments, Laboratory Accreditation, Internal Auditing, Writing and Assessing a Laboratory Quality Manual, Technical Management of the Weights and Measures Laboratory;
- Kelly Moody (AZ), L.F. Eason (NC): assisted with technical presentations;
- Herb Eskew (TX) and Ken Fraley (OK): Continuous improvement through round robin participation and the effects of thermal equilibrium on mass measurements;
- Karl Herken (KS): Round robin analysis; and
- ISO 9000 Task Force: The SWAP meeting ended with the Task Force meeting starting and many of the SWAP meeting attendees were able to participate in both meetings.

Tours: The group toured the Arkansas metrology laboratory.



## Metrology Report

Next meeting: The next meeting of SWAP will be held jointly with MidMAP, October 10 - 14, 1994, in Kansas City, MO.

**SEMAP: L. F. Eason (NC)**

Last meeting: April 10 - 15, 1994.

The last meeting of SEMAP was hosted by Mike Kramer and Milt Hargrave of the Virginia Department of Agriculture and Consumer Services in Richmond, VA. All States were represented at the 1994 SEMAP meeting. Additional participants included metrologists from Texas, Duke Power, and Hi-Tech, Inc..

Current round robins:

- 1) two 1-lb standards for precision comparison of avoirdupois standards

1994 Topics:

- Kelvin Boone (MS): Software Quality Assurance;
- Martin Coile (GA): Environmental instrumentation survey results;
- Barry Smith (FL): Round robin analysis;
- Herb Eskew (TX): Continuous improvement through round robin participation and the effects of thermal equilibrium on mass measurements;
- Georgia Harris (NIST): Control Charts, Uncertainties, mass code calibrations;
- Tim Scott (Brooks Instruments): Presented technical information and a video regarding small volume provers and an SOP developed for laboratory testing of the device; and
- An NCSL Region 3 section meeting was arranged on Friday at the same location, so many participants were able to attend the SEMAP meeting and the NCSL meeting.

Tours: The group toured the Virginia metrology laboratory.

Next meeting: The next meeting of SEMAP will be held April 23 - 27, 1995, in Raleigh, NC.

**CaMAP: José Torres Ferrer (PR)**

Last meeting: February 7 - 11, 1994.

The last meeting was held at the University of Puerto Rico in Mayaguez, PR and was coordinated by José Torres Ferrer. The 1994 participants included the government laboratories of Puerto Rico, U.S. Virgin Islands, Trinidad-Tobago, Ecuador, Barbados, Grenada, Dominican Republic, St. Lucia; industry participants were from B & C Calibration, Wesley-Jessen, National Standards of Puerto Rico, and Advanced Instruments Sales and Service. Additional participants were from Rice Lake Weighing Systems, Oklahoma, and Sartorius. The group hosted an NCSL section meeting on Friday which included additional participation by Abbott Laboratories and PACO PR, Inc.. Mr. Ralph Bertermann (Abbott Laboratories) attended and is the current NCSL President.

Round robins:

- 1) one 1-kg, 500-g, and two 200-g standards; continuation of mass round robin
- 2) liquid-in-glass thermometer round robin (continuation of one conducted in the States); and
- 3) one 20-liter volumetric test measure.

Topics:

- Ken Fraley (OK): CaMAP round robin analysis;
- José Torres Ferrer (PR): GMP 1, SOP 3, GMP 3, SOP 19, 21 on mass and volume measurements;
- Ken Fraley (OK): Continuous improvement through round robin participation and the effects of thermal equilibrium on mass measurements; and
- Georgia Harris (NIST): Statistics, Control Charts.

José Torres Ferrer provided Spanish translation and facilitated discussion for those topics presented in English. Both languages were used for all topics.

Next meeting: The next meeting of CaMAP will be held February 6 - 10, 1995, at the University in Mayaguez, PR.

## Work Project Status and Development

A memorandum will be sent from the Office of Weights and Measures to determine the interest and support for the following projects as discussed by the metrologists at the meeting.

*Develop a calibration interval guide for field standards.* Laboratory staff handle numerous questions regarding appropriate calibration intervals for field standards as well as for standards submitted for calibration by industry. Guidelines are legally required in the case of voluntary registration programs or are anecdotal and unwritten. The NCSL has a recommended practice on calibration intervals, with statistical guidelines for determining what is best for each item or type of item to be periodically calibrated. The laboratories would like a guide based on practice, using data collected through reverification when items are routinely submitted for calibration. For example, a number of jurisdictions have data to support how often cast iron field standards should be tested. Data are available to show that jurisdictions vary the calibration interval for 50-lb test weights between 6 months and 5 years depending on care and maintenance of the equipment; however, in most cases the calibration interval (1 or 2 years) for Class F test weights is dictated by legal requirements. Laboratories are also routinely asked how often a 100-g weight kit should be tested, but there are no hard and fast rules, particularly because these weights are generally not covered by legal requirements.

*Standard Operating Procedure (SOP) for use of sensitivity weights on electronic balances.* The double substitution procedure as documented in NIST Handbook 145 uses a sensitivity weight to calibrate the optical scale of the balance in the observational range. This was a necessity on equal-arm or single-pan mechanical balances due to calibration of the scale divisions or the inaccuracy and drift of the optical scale. With newer electronic balances available, a number of laboratories have been testing the stability of the calibration and have found that the value of the scale divisions are often more stable than sensitivity weights; however, this is not always the case. A test procedure for evaluating an electronic balance and a double substitution procedure, modified to eliminate the need for sensitivity weights, must be documented for laboratories to adopt these new procedures.

*Examination Procedures Outline (EPO) for gravimetric testing of meters (e.g. motor oil).* A number of metrologists have been developing procedures for gravimetrically testing meters in the field. Draft procedures have been developed in several jurisdictions, but no formal EPO has been recognized.

*Brochure for users of analytical balance services (what should they look for in service).* A concern was raised by the metrologists in 1993 regarding the number of scale companies that purchase Class I mass standards and go into the business of calibrating laboratory balances and precision mass comparators with no training or experience in this area. The applications and requirements needed for analytical balances are different from and more stringent than those required for Class III commercial devices and should be a concern for the user. Metrologists recommended that a brochure be developed to advise the user on how to select appropriate service companies for Class I and Class II balances and scales.

*Study operating characteristics of mass flow meters.* An interest was expressed in 1992 regarding a study of mass flow meters and appropriate test procedures in the laboratory.

*Standard Operating Procedure (SOP) for weighing designs such as those in Technical Note 952.* The laboratories that have participated in Advanced Mass training have found a need to have an SOP developed for typical weighing designs such as those found in NIST Technical Note 952. The procedures are described in the Technical Note, but an SOP is not available. With a requirement similar to eliminating the use of sensitivity weights on the newer electronic balances, a documented procedure must exist for the laboratory to comply with documentation requirements.

*Develop guide for laboratory software verification and validation.* Interest has been expressed in software verification and validation for quite some time. Data sets have been used to test programs in the laboratory, but have not been fully developed. Two committees in NCSL are working on developing a recommended practice for software verification and validation in the metrology laboratory. Additionally, the topic has been discussed at some of the 1994 regional metrology meetings. A formal guide for software quality assurance is to be developed for use by the laboratories, perhaps in cooperation with NCSL committees rather than proceeding independently.

*Implement changes necessary to incorporate small volume provers into field practices.* Tim Scott, of Brooks Instruments, has given presentations at the 1994 SEMAP meeting and at the NCWM meeting in San Diego. A number of companies in the petroleum industry use small volume provers to test meters rather than open neck type provers. Tim Scott has developed an SOP to test small volume provers in the laboratory by working with L. F. Eason (NC), Mike Cook (FL),

## Metrology Report

and Barry Smith (FL). Mr. Scott has also been working to develop a Handbook 105 for small volume provers. Field testing has also been coordinated to compare results between the small volume provers and open neck provers. Assistance to review draft documents and implement recommendations is needed to recognize small volume provers as a viable, and perhaps recommended, alternative to open neck provers.

*Review training modules as developed by the National Training Program for consistency with laboratory processes.* Concerns have been raised by the metrologists that training modules for field staff should be reviewed by metrologists to make sure that the EPO and training procedures are consistent with procedures used to test standards in the laboratory. An example is the pour and drain requirements for the 5-gallon test measures. A significant amount of testing has been done by the metrologists in round robins to show that the 30-second pour followed by a 10-second drain is extremely important in achieving consistent and accurate results. The procedure must carry through to the field applications to avoid inaccurate test results.

*Develop guidelines for the "best" operation of new electronic balances.* New electronic balances are replacing many of the older single-pan mechanical balances in the laboratories. Guidance given to the metrologists on how to get the best results has varied significantly. Compiling the numerous recommendations and experience into a general guideline to be used in training and in the laboratories is needed. Dr. Walter Kupper (Mettler) facilitated a discussion regarding this issue and indicated his support for developing recommendations.

*Develop an accreditation program for weights and measures programs.* A new NCWM work group on "Program Evaluation" has been started to carry over the work of the Task Force on the 21st Century and the Privatization Work Group. Details of the goals and objectives have yet to be worked out, but may eventually include a recommendation for accrediting the overall weights and measures program similar to the laboratory accreditation program. Metrologists can play an important role in the development and implementation of such a program. This activity was also one of the recommendations of the ISO 9000 Task Force.

*Prepare recommendations to update NIST Handbook 130 regarding laboratory and accreditation issues.* A number of sections in the model laws need to be updated consistent with the laboratory accreditation program. Many State laws indicate that the laboratory must be "certified" or that measurements must be made by a "certified" laboratory. Laboratories are accredited rather than certified. Additionally, NIST's National Voluntary Laboratory Accreditation Program (NVLAP) will accredit laboratories that are not part of the legal metrology system, and recommendations must be made regarding those laboratories. This activity was one of the recommendations of the ISO 9000 Task Force.

*Conduct laboratory tests on levels to be used on volumetric provers.* Handbook 105-3 is being updated and the American Petroleum Institute (API) has requested that NIST study the specifications and requirements for the levels used on test measures and provers as a part of the 105-3 update.

*Prepare recommendations to adopt all 105-series handbooks for field standards into NIST Handbook 44.* A number of new 105-series handbooks are being developed for LPG provers, timing devices, and thermometers used in legal metrology applications. Older 105-series handbooks are being updated. A request was made to formally reference these specifications and tolerances in Handbook 44.

## ISO 9000 Task Force Status Report

*Brochure.* A brochure was developed based on the "ISO 9000 Brainstorming Sessions" held at the 1993 regional metrology meetings in conjunction with the NCWM ISO 9000 Task Force. Copies of the brochure were distributed at the meeting and will be circulated to laboratories in the State Laboratory Program.

*Updated Criteria.* The ISO 9000 Task Force participated in the review of drafts of the updated NIST Handbook 143 and presentations of technical criteria at all 1993 regional metrology meetings. No additional work was planned for the task force. Items of continuing concern were presented in the 1993 annual report and to the Executive Committee for further action.

## Working Sessions

### Handbook 143 Draft

A draft of NIST Handbook 143 Program Handbook was distributed for review and comment. A working session was held to review Sections 3 and 4. Copies of the draft have been circulated to all State laboratories for additional comment specifying that attention should be addressed to Sections 3 and 4.

Sections 5 and 6 are identical to NVLAP Handbook 150 and incorporate ISO Guide 25 and the newly adopted ANSI/NC SL Z 540-1-1994 standards for calibration laboratories. These are the nationally and internationally recognized standards for accreditation of calibration laboratories.

### Advanced Mass System Criteria Draft

Ken Fraley (OK) presented a draft document on the Advanced Mass System for State laboratories. This document is being developed to provide uniformity for both the State laboratories and the NIST Office of Weights and Measures when establishing and reviewing measurement control data, uncertainties, accuracy, and traceability when using advanced weighing designs and the NIST Mass Code. Ken has been working very closely with the Office of Weights and Measures to develop this guide. An updated draft will be circulated for additional review and comment during the next year.

## Miscellaneous Items

- Steve McGuire (IL): State Calibration Laboratory Assessments a paper presented at NCSL Annual Workshop and Symposium in Chicago;
- Tim Scott (Brooks Instruments): Small Volume Prover presentation on calibration procedures and draft Standard Operating Procedure (SOP) for Handbook 145;
- Dr. Lev Issaev (Committee of the Russian Federation for Standardization, Metrology and Certification, Gosstandart of Russia): presentation on Metrology in Russia (his written presentation found in the front of this Annual report);
- Jim Akey (WI): presentation of data regarding instability of 50-lb cast iron test weights maintained in the laboratory;
- Georgia Harris (NIST): Demonstration of Automated Environmental Data Collection, new systems and software developed by Andy Walker (Lab Wizard software) and hardware developed by Brian Fitzpatrick (Hi-Tech);
- Al Tholen (NVLAP): presented information regarding NVLAP accreditation of State legal metrology laboratories (which has been circulated to laboratories); and
- NIST Awards were presented by Dr. Peter Heydemann to metrologists who have provided "training" and "assessment" technical services to the NIST Office of Weights and Measures in support of State Laboratory Program objectives. These included the following individuals:

#### Training

José Torres (PR)  
 Martin Coile (GA)  
 Tom Schafer (ID)  
 Bruce Adams (MN)  
 Ron Balaze (MI)

#### Assessments

L. F. Eason (NC)  
 Kelly Moody (AZ)  
 Steve McGuire (IL)  
 Rick Calkins (Rice Lake Weighing)  
 Mike Dynia (CT)  
 Ken Fraley (OK)



### **Russian Metrology Under The New Legislation**

L. K. Issaev  
Vice President, Gosstandart of Russia

At all times in the past, metrology in Russia was of State concern from the IX century. The first scientific body in the field of metrology was established by law (Depot of Standard Weights and Measures) in 1842 in St. Petersburg.

Now, there are more than one billion measuring instruments and devices, as well as many measurement systems in the country. For verification and calibration purposes, there are more than 9 million working measurement standards and 500 reference measurement standards traceable to 117 State primary measurement standards. Many of the 7,000 types of certified reference materials approved at the State level are used for verification and calibration. The assurance of uniformity of measurement is supported by 2,600 technical documents, including approximately 500 standards.

Throughout the Russian Federation, there are 10 metrological research institutions with their State measurement standards and 100 weights and measures laboratories within the territorial bodies of the Gosstandart of Russia.

The territorial bodies are responsible for the supervision of a product's compliance with the mandatory requirements of standards, as well as for regional metrological supervision and control with the help of the State Inspectors. These institutions and territorial laboratories represent the State Metrological Service; in addition, more than 30,000 enterprises and organizations have their own metrology services.

In accordance with the Constitution of the Russian Federation, all State measurement standards, System of Units, and Time Scale are subjects of the Federal Competence. In April 1993, a law on the assurance of measurement uniformity passed through the Russian Parliament and was adopted by the President.

This law establishes the legal basis for the assurance of measurement uniformity in the Russian Federation, regulates the relations between the State administrative bodies and persons and juridical bodies, and also aims to protect citizens from the negative consequences of incorrect measurement results.

State administration of the activities related to the assurance of measurement uniformity in the Russian Federation is carried out by the Committee of the Russian Federation for Standardization, Metrology, and Certification (the Gosstandart of Russia). These responsibilities include the following:

- Inter-regional and interbranch coordination of activities for providing measurement uniformity;
- Submission of proposals to the Government concerning permitted units of measurements;
- Establishment of regulations for the production, approval, conservation, and application of measurement standards;
- Establishment of principal metrological requirements for measuring instruments, methods of measurement; and measurement results;
- Execution of State metrological control and supervision;
- Control of the observance of international treaties concerning the recognition of test and verification results for measuring instruments;
- Administration of the activities to be carried out by the State metrological service and other State services concerned with the assurance of measurement uniformity;



- Participation in the activities of international organizations concerned with the assurance of measurement uniformity.

The Gosstandart of Russia approves normative documents on the assurance of measurement uniformity; these documents establish the legally binding metrological regulations and norms in the territories of the Russian Federation.

The International System of Units, approved by the General Conference for Weights and Measures, and recommended by the International Organization of Legal Metrology, is admitted for use in the Russian Federation.

Characteristics and parameters of products for exportation, including measuring instruments, may be expressed in units of measurement that are established by the customer.

The State measurement standards are the exclusive Federal property and are subject to approval and supervision by the Gosstandart of Russia.

The State metrological service includes State scientific metrological centers and State metrological service bodies of the Republics that are part of the Russian Federation, autonomous regions and districts, territories, and cities of Moscow and St. Petersburg.

The Gosstandart of Russia is also in charge of the administration of the State service of time and frequency, the State service of certified reference materials and the State service of standard reference data.

The State scientific metrological centers are responsible for development, improvement, maintenance, and application of State measurement standards, as well as for development of standards on the assurance of measurement uniformity. The State metrological service bodies shall execute State metrological control and supervision to check the observance of metrological regulations and standards in various domains:

- Health services
- Environmental protection
- Assurance of labor safety
- Commercial transactions
- State accounting
- Assurance of State defense
- Geodetic and hydrometeorological activities
- Bank, taxation, customs, and postal operations
- Mandatory certification of products and services
- Measurements performed on the basis of mandates by juridical and State executive bodies
- Registration of national and international sports records.

In the areas covered by the State metrological control and supervision, measuring instruments are subject to mandatory testing with a view to their type approval.

Decisions concerning measuring instrument type approvals are made by the Gosstandart and attested by a certificate of type approval whose validity period shall be fixed at the time of its issue. Type approvals are recorded in the State register of measuring instruments kept by the Gosstandart.

An authorized mark shall be applied to approved measuring instruments, and operational documentation and information on type approvals is printed in the official publications of the Gosstandart of Russia.

Measuring instruments subject to State metrological control and supervision are verified by the State metrological service bodies during their production or repair, importation, and use. Only verified measuring instruments are allowed for sale or for rent. The list of the measuring instruments that must be verified is approved by the Gosstandart of Russia.

The State metrological control and supervision is accomplished by officials of the Gosstandart of Russia referred to as State Inspectors for the assurance of measurement uniformity. These inspectors are responsible for duly fulfilling their official obligations in keeping with the legislation of the Russian Federation.

Measuring instruments that are not subject to verification may be subject to calibration during their production or repair, importation, sale, rent, and use; this shall be carried out by metrological services of persons or juridical bodies using measurement standards traceable to the State measurement standards.

The Prime-Ministers of the Member States of the Community of Independent States (CIS) signed the "Agreement on coordinated policy in the fields of Standardization, Metrology and Certification" on March 13, 1992. Through this agreement, members of the CIS have obtained essential advantages for their producers and for mutual trade in a common economic space. All the previous Republics of USSR, except Baltic Republics, formed the CIS. Russia is a member of CIS.

At the intergovernmental level, it was agreed to recognize and to maintain use of the previous State Standards (norms) of the USSR (GOST) and State Measurement Standards of the USSR (etalons); it was also decided to maintain the uniformity of the measurements for time and frequency.

In 1991, the majority of East European countries (ex-CMEA members) set up a new metrological body known as COOMET.

Gosstandart of Russia, as the successor to the Gosstandart of the USSR, actively participates in international bodies such as the Metric Convention, OIML, ISO, and IEC.

## Report of the Resolutions Committee

Bruce Martell, Chairman  
Chief, Consumer Assurance Division  
Vermont Department of Agriculture

Reference  
Key No.

700

### GENERAL

The resolutions committee wishes to express the appreciation of the members of the National Conference on Weights and Measures to those who contributed their time and talents toward the arrangements for the conduct and success of this 79th Annual Meeting. Special votes of thanks are extended:

- (1) to Henry Voss, Secretary of the California Department of Food and Agriculture, for his welcoming remarks in which he indicated his support of the work of the Conference, and all of weights and measures;
- (2) to Brian Bilbray, Supervisor of the First District, Board of Supervisors, County of San Diego, for his welcoming remarks in support of the work of the Conference, and of weights and measures in general;
- (3) to Sergeants at Arms, Robert Keadle, Monterey, California, and William Korth, Ventura County, California;
- (4) to Dr. Peter Heydemann, Director of Technology Services of the National Institute of Standards and Technology (NIST), for his remarks to the membership and for continuing the NIST partnership with NCWM for the future; to Dr. Heydemann for his vision for the future of weights and measures and his expressions of NIST commitment to strengthen its partnerships with business, Federal, State, and local governments in the area of weights and measures;
- (5) to the San Diego Department of Agriculture, Weights and Measures Division, for the extraordinary assistance in preparation for and conduct of the 79th Annual Meeting, particularly the work of Kathleen Thuner, Sealer for the City of San Diego, along with her staff;
- (6) to our international speakers, Paul Allen, Chairman of the U.K.'s Institute of Training Standards Administration, and L. K. Issaev, Vice President, Gosstandart of Russia, for their informative and enlightening presentations;
- (7) to Mary Bach for her entertaining and informative presentation on scanner inaccuracies and their impact on consumers;
- (8) to Ron Goodstein for the presentation covering his research on the accuracy of U.P.C. Pricing Systems;
- (9) to Tom Geiler, Chairman, and the officers and appointed officials of the National Conference on Weights and Measures for their assistance and service toward progress on national issues;
- (10) to committee members for their efforts throughout the past year preparing and presenting their reports; to the subcommittees and work groups for their discerning and appropriate recommendations;
- (11) to regulatory officials of State and local jurisdictions for the advice, interest, and support of weights and measures administration in the United States;

## Resolutions Committee

- (12) to representatives of business and industry for their cooperation and assistance in committee and Conference work, most especially the support of training demonstrated by the granting of 22 scholarships of \$500 each for inspector training; to the associate membership organization for the hospitality exhibited in sponsored social functions; particularly Chris Guay, Regulatory Affairs Manager, Procter & Gamble Company, for arranging the outstanding excursion to the San Diego Zoo for the enjoyment of Conference members and their guests;
- (13) to the staff of the Doubletree Hotel-Horton Plaza for their assistance and courtesies, all of which contributed to the enjoyment and comfort of the delegates within their fine facilities; and
- (14) to the National Institute of Standards and Technology and its Office of Weights and Measures for their outstanding assistance in planning and conducting the work and program of the National Conference on Weights and Measures, especially to Ann Turner, Elizabeth Loveless, Michele Krebs, and Lynn Sebring for their professional and hospitable conduct of the administrative operations of the meeting.

B. Martell, Chairman, Vermont

C. Fulmer, South Carolina

W. Lagemann, Delaware

R. Philmon, Illinois

J. Silvestro, Gloucester County, New Jersey

J. Mindte, NIST, Coordinator

## Resolutions Committee

## Report of the Nominating Committee

Allan M. Nelson, Chairman  
Director, Weights and Measures  
Department of Consumer Protection  
Connecticut

Reference  
Key No.

**800**

The Nominating Committee met during the Interim Meeting at the Hyatt Regency, Bethesda, Maryland, and nominated the persons listed below to be officers of the 80th Conference. In the selection of nominees from active membership, consideration was given to professional experience, qualifications of individuals, Conference attendance and participation, and other factors considered to be important.

The following slate of officers was selected by unanimous vote of the Nominating Committee:

**CHAIRMAN-ELECT:** Charles A. Gardner, Suffolk County, New York

**VICE-CHAIRMEN:** Fred P. Clem, Columbus, Ohio  
Dean F. Ely, Pennsylvania  
Darrell A. Guensler, California  
Danny Willis, Kentucky

**EXECUTIVE COMMITTEE:** Bruce Adams, Minnesota  
Barbara J. Bloch, California

**TREASURER:** Charles A. Gardner, Suffolk County, New York

A. Nelson, Connecticut, Chairman

S. Colbrook, Illinois  
C. Gardner, Suffolk County, New York  
M. Gray, Florida  
S. Rhoades, Arizona  
G. Shefcheck, Oregon  
N. David Smith, North Carolina

**Nominating Committee**



## Report of the Auditing Committee

Robert Gunja  
Standards Administrator, Kansas City  
Kansas

Reference  
Key No.

**900**

The Auditing Committee met on Sunday afternoon, January 9, 1994, during the NCWM Interim Meeting, for the purpose of reviewing the financial reports of the Conference Treasurer, Charles A. Gardner; Ann H. Turner, Weights and Measures Coordinator, was also in attendance.

The Auditing Committee finds the financial reports of the Conference Treasurer to be in accordance with Conference procedure and correct.

R. Gunja, Kansas City, Kansas, Chairman

J. H. Eskew, Texas

R. Kalentkowski, Connecticut

J. Mindte, NIST, Coordinator

**Auditing Committee**

## Treasurer's Report

Trail Balance as of 12/30/93		
Income Accounts		
411.1	Annual Registration	\$32,450.00
411.2	Interim Registration	\$8,050.00
412.1	Government Member Fees	\$56,595.00
412.2	Associate Member Fees	\$60,620.00
413	Interest	\$1,484.33
416.6	Other - Industry CEU	\$3.00
416.9	Other - Miscellaneous	\$0.00
481.4	Recepts/Meeting Rooms	\$581.81
481.4	Joint Outing	\$1,665.00
482.4	NTP Modules	\$1,870.00
482.2A	NCWM Publication 5	\$10,325.00
482.2B	NCWM Publications (Other)	\$2,757.00
482.3	Videos - Sales	\$2,073.30
482.4	Handbook 133-3rd Edition	1,408.00
483.1	NTP Operations	\$2,000.00
483.2	CoC Maintenance Fees	\$86,600.00
413	NTP Seminar	\$1.00
484.1	Advanced Metrology	\$0.00
485	Promotions	\$0.00
486	Grain Moist.Coop Agreement	\$13,624.29
<b>Total Income</b>		<b>\$282,106.73</b>

Treasurer's Report

Trial Balance as of 12/30/93		
Expense Accounts		
511 - Annual		
511.1	Hotel/Food Services	\$17,084.07
511.2	Equipment/AV/Supplies	\$108.13
511.3	Personnel/Photo	\$930.57
511.4	Print/Copy	\$1,379.85
511.6	Awards	\$1,341.66
511.6	Treasurer Committee Expenses	\$691.76
511.7	Print Announcement	\$6,431.40
511.4	Miscellaneous	\$3,885.44
Total 511		\$31,852.88
512 - Interim		
512.1	Hotel/Food Services	\$5,796.78
512.2	Equipment/Personnel/Printing/Misc.	\$1,053.95
512.3	Executive Committee	\$4,177.30
512.4	Laws and Regulations Committee	\$3,062.60
512.5	Specifications and Tolerances Committee	\$3,760.60
512.5	Education Committee	\$4,198.12
512.7	Liaison Committee	\$0.00
512.8	Other & Task Forces	\$1,625.20
512.7	Print Agenda	\$2,913.40
Total 512		\$26,587.95
513 - Committee Meetings		
513.1	Executive Committee/Board of Govonors	\$5,685.56
513.2	Laws and Regulations Committee	\$11,975.37
513.3	Specifications and Tolerances Committee	\$7,129.93
513.4	Education Committee	\$3,075.51
513.5	Liaison Committee	\$0.00
513.6	NTETC	\$11,183.94
513.7	Annual	\$2,766.50
Total 513		\$41,816.81
514 - Task Forces/Specific Committees		
514.1	Privatization Task Force	\$8,018.61
513.2	Checkweigher Group	\$3,004.42
513.1	OIML	\$0.00
514.4	FPLA - Metric Work Group	\$411.00
514.5	USA/Canada Work Group	\$10,864.01
514.6	Petroleum Sub-Committee	\$10,570.42
514.7	ISO 9000 Task Force	\$3,395.80
	Other	\$1,664.46
Total 514		\$37,928.72

<b>515 Chairman/Chairman-Elect</b>		
515.1	Chairman	\$8,106.41
515.2	Chairman-Elect	\$6,338.37
515.3	Chairman Breakfasts	\$991.47
<b>Total 515</b>		<b>\$15,436.25</b>
<b>516 - Administration</b>		
516.1	Equipment/Supplies Stationery	\$ 438.88
516.2	Contracts/Personnel	\$39,119.14
516.3	Mail/P.O. Box	\$155.00
516.4	Treasurer's Bond	\$0.00
516.5	Bank Charges	\$58.74
516.6	National Training Program	\$1,190.00
516.9	Miscellaneous	\$236.66
<b>Total 516</b>		<b>\$41,198.42</b>
<b>517 - Printing/Publications</b>		
517.1	Membership	\$1,308.00
517.2	NCWM Publications - Member	\$12,744.90
517.3	Consumer Pamphlet	\$14,074.56
517.4	Handbooks and Videos	\$0.00
517.9	Miscellaneous	\$0.00
<b>Total 517</b>		<b>\$28,127.46</b>
<b>518 - Train-the-Trainers</b>		
518.1	Train-the Trainers	\$100.00
518.2	Training	\$688.85
<b>Total 518</b>		<b>\$788.85</b>
<b>581 - Special Events</b>		
581.1	Annual	\$0.00
581.2	Interim	\$0.00
581.3	Receipts/Meetings	\$0.00
581.4	Joint Outing	\$0.00
<b>Total 581</b>		<b>\$0.00</b>
<b>582 - Publications</b>		
582.1	Modules	\$153.50
582.2A	NCWM Publication 5	\$11,783.10
582.2B	NCWM Publication (other)	\$0.00
582.3	Videos	\$3,923.30
582.4	Handbook 133 3rd Edition	\$5,049.00
<b>Total 582</b>		<b>\$20,908.90</b>

Treasurer's Report

583.1	NTEP Operations	\$210.00
583.2	CoC Maintenance	\$0.00
584	NTP Seminars	\$0.00
585	Promotions	\$0.00
586	Grain Equipment Coop Agreement	\$7,599.75
<b>Total Expenses</b>		<b>\$252,455.99</b>
Associate Account	\$12,748.29	NCWM Bank Balances
Start of Year Balance	\$99,747.36	EAB \$101,010.42
Income	\$282,106.73	Signet \$314.84
Expenses	\$252,455.99	CD #1 \$28,072.84
Current Balance	\$129,398.10	CD #2 \$0.00
		Current Balance \$129,398.10



**Treasurer's Report  
Grant Account  
1993**

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Beginning Balance	Deposits	Payments	Closing Balance
\$4,566.95	\$22,088.05 (Interest = \$88.05)	\$22,663.50	\$3,991.50

## **New Chairman's Message**

Thursday, July 21, 1994

**James C. Truex**  
**Acting Chief, Division of Weights & Measures**  
**Ohio Department of Agriculture**

### **"Quality Partnerships and Programs through Education"**

I would ask that Tom Geiler please remain at the podium. Also, if Charlie Gardner would join us at the podium for the remainder of the session.

I have thoroughly enjoyed this past twelve months traveling the country with Tom Geiler. Those of us who have known Tom for many years have known through his comments that he believes in the NCWM and is completely dedicated to its cause. I can personally tell you, in all honesty, that he did not disappoint any of us with his drive to make the successes and mission of the Conference known. From the man on the street, to the Director of NIST, to the U.S. House of Representatives, he highlighted the NCWM as a fair system that works. He even wrote President Clinton a letter on behalf of the Conference.

He's a Massachusetts Democrat which means he has an opinion on everything that he's not afraid to express. Tom, on behalf of the National Conference on Weights and Measures, please accept this Certificate of Appreciation for your dedicated leadership as Conference Chairman. Well done my friend. Thank you.

I've asked your Chair-Elect, Charlie Gardner to join me at the podium. Charlie and I have been friends for many years. He is one of those people who is respected and liked by everyone. I congratulate the Conference for electing Charlie to the position. Bill Corey has been elected Chairman of the 94/95 Associate Membership Committee. Bill had to fly home this morning or he would be at the podium with us. We know Bill Corey to be a hard-working friend of the Conference and a dedicated individual. Bill, Charlie, and I will work for the Conference in a partnership mode this next year. Let us here from you.

I think every Chairman-Elect feels compelled to review reports of previous Conferences. I am no different. In doing so, I noticed that Chairmen like to use inspirational quotes from personalities like Yogi Berra and John F. Kennedy. Well, I'm going to keep it a little closer to home. Some very good advice, observations, questions and inspirational comments have been stated by NCWM Chairmen during their addresses. I'd like to take the time to restate a few.

by Fred Gerk (1989)

"Keep your pants pulled up and don't talk with your mouth full."

by David Smith (1991)

"Eating grits can make you famous."

Time to get serious.

by Ken Simila (1979)

"Equity is on the move. Will we be alive when we get there? That I don't know."

by Ed Heffron (1982)

(talking about the NCWM and NBS) "The wisdom of this relationship was probably not fully envisioned when in January 1905 seven States and the District of Columbia met in Washington."

by Darrell Guensler (1988)

"We must learn to cope with Federal preemption issues which relate to weights and

measures."

by John Bartfai (1989)

"Without enforcement, NTEP becomes another transparency."

by David Smith (1990)

"As we prepare for the 21st Century, I feel that the National Conference must take stock of itself and plot a course of where we want to go or others will surely plot that course for us."

by Sid Colbrook (1991)

"The adoption of the Conference standards benefits manufacturers, packagers, other members from industry, weights and measures officials, but most importantly, it benefits all consumers."

by Allan Nelson (1992)

"NCWM partnership with industry is an area that I believe needs further development. Industry is, and has consistently been, a valued partner of the NCWM."

by Tom Geiler (1993)

"The coming together of regulatory officials, device manufacturers, device users, and consumer representatives for the purpose of developing laws and regulations which will work for all parties concerned, is a proven winner. Our process is one which can and should stand as a model regulatory function."

Some thought provoking words from knowledgeable and successful Chairmen.

One last bit of advice from Fred Gerk in his 1989 address, "if all else fails - lower your standards."

I have chosen the theme "Quality Partnerships and Programs through Education" for the 80th National Conference on Weights & Measures. I think that the membership of the NCWM works as a partnership. NIST, the States, industry associations, W&M officials, industry representatives, the LMB of Canada, and other interested individuals, work together as a partnership towards a goal of equity in the marketplace. We need to continue to improve on the quality of our partnerships and our weights and measures programs to meet today's challenges. Education is a key to improvement.

As I stated, I have spent considerable time reviewing published Conference reports in planning for the 80th Conference. You've already heard a sample of the advice I noted from former Chairmen. I also carefully combed the reports of the "Task Force on Planning for the 21st Century", the "Privatization Work Group", and the report of this year's special meeting of the Committee on Education, Administration, and Consumer Affairs. Some very professional W&M people contributed to information contained in the reports. Therefore, I decided not to try and reinvent the wheel, rather to take their advice and the advice of many others in this room in deciding what issues to emphasize.

I plan to place emphasis on the following areas:

1. Developing training vehicles to deliver training to W&M jurisdictions and industry on NTEP administration, field enforcement of NTEP, new packaging and labeling requirements, new package checking procedures, the NTP Modules, etc. We have some of the cargo (training modules and other material) but we do not have all the vehicles (trainers) needed to deliver the cargo.
2. Work towards the development of an improved electronic communications and information system - a computer network for the W&M community.
3. Study the feasibility of a uniform training program and certification requirements for W&M jurisdictions. Should W&M have a training curriculum? Should W&M establish minimum training requirements? ISO 9000 and other QA programs are

requesting W&M laboratories and inspectors to produce certifications, certificates and other documents of traceability. Should W&M establish minimum program standards and/or a means of program certification? It's time to deal with these questions.

4. Establish a "Cost Benefit Work Group" to assist W&M jurisdictions in establishing priorities, measuring effectiveness, evaluating their own programs, and justifying their own programs. What is the cost benefit of W&M programs to consumers? What is the cost benefit of W&M to industry?
5. Further the effort to build OIIML testing capabilities into NTEP.
6. Work with industry to lay the foundation to deal with the "production meets type" issue.

Other issues on the Conference agenda that may need significant study and attention:

1. Device software and computer interfaces.

The plans I have just outlined are just words. I plan to address them in greater detail at the regional conferences. I sincerely pledge to you that my goal is to be able to report some progress and successes as part of my "State of the Conference Address" during the 80th NCWM in Portland, Maine next July.

I will now announce my committee appointments for the 80th NCWM. To have the opportunity to make these appointments is a privilege. A privilege I took very seriously. I started with a long list of names put together by myself and my peers. The appointees consist of a mix of experience and qualified new, energetic, young blood. The following individuals have agreed to help Charlie Gardner and me guide the NCWM.

<b>Specifications &amp; Tolerances Committee</b>	Daryl Brown, Iowa 5-year term
<b>Laws &amp; Regulations Committee</b>	Karl Angel, West Virginia 5-year term
<b>Education, Administration, and Consumer Affairs Committee</b>	Richard Greek, San Luis Obispo County, California 5-year term
<b>Resolutions Committee</b>	Clayton Davis, Maine 3-year term Jerry Bane, Iowa 3-year term David Wallace, Colorado 3-year term
<b>Credentials Committee</b>	Angie McCoy, City of Columbus, Ohio 3-year term Cosmo Insalaco, Fresno County, California 3-year term
<b>Auditing Committee</b>	Monty Hopper, Kern County, California 3-year term

**Budget Review Committee**

N. David Smith, North Carolina  
continues with a 1-year term  
Harvey Lodge, Cargotec  
continues with an extended  
2-year term

Darrell Guensler, California  
3-year term  
Dave English, Measurement Systems International  
4-year term

**Nominating Committee**

(All 1-year terms)  
Allan Nelson, Connecticut  
Steve Malone, Nebraska  
George Shefcheck, Oregon  
Darrell Guensler, California  
N. David Smith, North Carolina  
Lou Straub, Maryland

**Chaplain**

William Lagemann, Delaware

**Parliamentarian**

Ken Simila, Oregon

**Assistant Treasurer**

Fred Clem, City of Columbus, OH

**Sergeants-at-Arms**

Daniel Newcombe, Maine  
Conrad Brown, Maine

**Associate Membership Committee**

Chair: Bill Corey, American Frozen Foods  
Vice Chair: Richard Davis, James River Corp.  
Secretary: Jennifer Colman, Food Marketing Institute  
Treasurer: Tom Stabler, Mettler-Toledo

Members: Chris Guay, Procter & Gamble  
Paul Zalon, Nestle USA  
Gale Prince, The Kroger Co.  
Bob Fuehne, Ralston Purina  
Bill Braun, WHB Resources  
Dave Quinn, Fairbanks Scales

**Technical Committee on National  
Type Evaluation**

► Weighing Sector David Hawkins, Thurman Scale  
► Measuring Sector William West, Ohio  
(replaces J. Truex)

I know I speak for myself, Charlie Gardner, Bill Corey, Carroll Brickenkamp and her staff, and all committee members when I say, we'll do our best to serve you well. Thank you again for this opportunity.



**NCWM 79th Annual Meeting  
July 17-21, 1994  
San Diego, California**

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