Specifications and Tolerances (S&T) Committee
2017 Interim Report

Dr. Matthew Curran, Committee Chair
Florida

3000 INTRODUCTION

The S&T Committee (hereinafter referred to as the "Committee") submits this Committee Interim Report for consideration by National Conference on Weights and Measures (NCWM). This report contains the items discussed and actions proposed by the Committee during its Interim Meeting in San Antonio, Texas, January 8-11, 2017. The report will address the following items in Table A during the Annual Meeting. Table A identifies the agenda items by reference key, title of item, and page number and addresses the appendices by appendix designations and page number. The acronyms for organizations and technical terms used throughout the report are identified in Table B. The headings and subjects apply to NIST Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, 2017 Edition*. The first three digits of an item's reference key are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

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

Committees may change the status designation of agenda items (Developing, Informational, Voting, and Withdrawn) up until the time that the report is adopted, except that items which are marked Developing, Informational or Withdrawn cannot be changed to Voting Status. Any change from the Committee Interim Report (as contained in this publication) or from what appears on the addendum sheets will be explained to the attendees prior to a motion and will be acted upon by the active members of NCWM prior to calling for the vote.

An "Item under Consideration" is a statement of proposal and not necessarily a recommendation of the Committee. Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***. Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

All sessions are open to registered attendees of the conference. If the Committee must discuss any issue that involves proprietary information or other confidential material; that portion of the session dealing with the special issue may be closed provided that (1) the Chairman or, in his absence, the Chairman-Elect approves; (2) the Executive Director is notified; and (3) an announcement of the closed meeting is posted on or near the door to the meeting session and at the registration desk. If at all possible, the posting will be done at least a day prior to the planned closed session.

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

Subject Series List

Table A
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Appendices

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing System	NEWMA	Northeastern Weights and Measures Association
AAR	Association of American Railroads	NIST	National Institute of Standards and Technology
API	American Petroleum Institute	NTEP	National Type Evaluation Program
CNG	Compressed Natural Gas	OIML	International Organization of Legal Metrology
CWMA	Central Weights and Measures Association	OWM	Office of Weights and Measures
EPO	Examination Procedure Outline	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GMM	Grain Moisture Meter	SD	Secure Digital
GPS	Global Positioning System	SI	International System of Units
HB	Handbook	SMA	Scale Manufactures Association
LMD	Liquid Measuring Devices	SWMA	Southern Weights and Measures Association
LNG	Liquefied Natural Gas	TC	Technical Committee
LPG	Liquefied Petroleum Gas	USNWG	U.S. National Work Group
MMA	Meter Manufacturers Association	VTM	Vehicle Tank Meter
MDMD	Multiple Dimension Measuring Device	WIM	Weigh-in-Motion
NCWM	National Conference on Weights and Measures	WWMA	Western Weights and Measures Association

Details of All Items
(In order by Reference Key)

3100 – GENERAL CODE

3100-1 D G-S.5.2.2. Digital Indication and Representation (See related items 3200-5 and 3600-2)

Source:
Ross Andersen, Retired (2017)

Purpose:
Address application of the code requirements across multiple devices.

Item under Consideration:
Amend NIST Handbook 44 General Code as follows**:**

G-S.5.2.2. Digital Indication and Representation. – Digital elements shall be so designed that:

(a) All digital values of like value in a system agree with one another.

(b) A digital value coincides with its associated analog value to the nearest minimum graduation.

(c) A digital value "rounds off" to the nearest minimum unit that can be indicated or recorded.

(d) A digital zero indication includes the display of a zero for all places that are displayed to the right of the decimal point and at least one place to the left. When no decimal values are displayed, a zero shall be displayed for each place of the displayed scale division.
[Nonretroactive as of January 1, 1986]

(e) A digital value that is electronically summed from the digital indications of multiple independent devices shall be mathematically correct.
[Nonretroactive as of January 1, 20XX]
(Amended 1973, and 1985**, and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A6.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3100-2 W G-UR.3.3. Position of Equipment

Source:
Illinois (2017)

Purpose:
Eliminate interpretation differences, while also demonstrating an apparent need for customer readability and giving the statutory authority permission to require visible indications for ease of test procedures.

Item under Consideration:
Amend NIST Handbook 44 General Code as follows**:**

G-UR.3.3. Position of Equipment. – A device or system equipped with a primary indicating element and used in direct sales, except for prescription scales, shall be positioned so that its indications may be accurately read and the weighing or measuring operation may be observed from some reasonable "customer" and "operator" position. The permissible distance between the equipment and a reasonable customer and operator position shall be determined in each case ~~**upon the basis of the individual circumstances**~~ **by the official with statutory authority, who shall base the determination on "customer readability" and ease of testing procedures,** particularly the size, character, and **position** of the indicating element. **(e.g., A deli customer shall be able to read the indications from the patron side of the deli counter, whereas a truck driver shall be able to read the indications from the cab of the vehicle.) (Also see G-UR.4.4. Assistance in Testing Operations. and Appendix D. direct sales.)**

Background/Discussion: See Appendix A, Page S&T-A14.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200 SCALES

3200-1 V S.1.2. Value of Scale Division Units and Appendix D – Definitions: batching scale

Source:
Richard Suiter Consulting (2017)

Purpose:
Recognize batching systems as a device type in the scales code to help officials differentiate between them and automatic bulk weighing systems.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

S.1.2. Value of Scale Division Units. *– Except for* ~~***batching scales and***~~ *weighing systems used exclusively for weighing in predetermined amounts, the value of a scale division "d" expressed in a unit of weight shall be equal to:*

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5; or

Examples: scale divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

(c) a binary submultiple of a specific unit of weight.

Examples: scale divisions may be ½, ¼, 1/8, 1/16, etc.
[Nonretroactive as of January 1, 1986]

And add a new definition for the term "batching scale" into NIST Handbook 44, Appendix D – Definitions as follows:

batching scale. – Any scale which by design or construction, lends itself readily to use in proportioning ingredients by weight. 2.20

Background/Discussion: See Appendix A, Page S&T-A15.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-2 V S.1.2.2. Verification Scale Interval

Source:
Oregon (2017)

Purpose:
Reduce confusion for the buyer and seller by prohibiting the display of "d" smaller than "e" for Class I and II scales when used in direct sales.

Item under Consideration:
Add a new Scales Code paragraph S.1.2.2.2. to NIST Handbook 44 and renumber existing paragraph S.1.2.2.2. as follows:

S.1.2.2. Verification Scale Interval.

S.1.2.2.1. Class I and II Scales and Dynamic Monorail Scales. If $e \neq d$, the verification scale interval "e" shall be determined …

S.1.2.2.2. Class I and II Scales used in Direct Sales. When accuracy class I and II scales are used in direct sale applications the value of the displayed division "d" shall be equal to the value of the verification scale interval "e."
(Added 20XX) ***(Nonretroactive as of January 1, 2020)***

S.1.2.2.~~2~~3. Class III and IIII Scales. The value of "e" is specified by the manufacturer as marked on the device. Except for dynamic monorail scales, "e" must be less than or equal to "d."
(Added 1999) **(Amended 20XX)**

Background/Discussion: See Appendix A, Page S&T-A18.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-3 V S.1.8.5. Recorded Representations, Point of Sale Systems and S.1.9.3. Recorded Representations, Random Weight Package Labels

Source:
Kansas, Minnesota, and Wisconsin (2017)

Purpose:
Provide verification to consumers through recorded representation that tare has been taken at point of sale for sales from bulk.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

S.1.8.5. Recorded Representations, Point-of-Sale Systems. – The sales information recorded by cash registers when interfaced with a weighing element shall contain the following information for items weighed at the checkout stand:

(a) the net weight;[1]

(b) the tare weight;[1]

(~~b~~**c**) the unit price;[1]

(~~c~~**d**) the total price; and

(~~d~~**e**) the product class or, in a system equipped with price look-up capability, the product name or code number.

[Non-retroactive January 1, 2020]
(Amended 20XX)

[1] For devices interfaced with scales indicating in metric units, the unit price may be expressed in price per 100 grams. Weight values shall be identified by kilograms, kg, grams, g, ounces, oz, pounds, or lb. *The "#" symbol is not acceptable.*
[Nonretroactive as of January 1, 2006]
(Amended 1995 and 2005)

Background/Discussion: See Appendix A, Page S&T-A19.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-16 to review these documents.

3200-4 D Table 3, Parameters for Accuracy Classes (See related item 3200-8)

Source:
Meridian Engineers Pty Ltd. (2017)

Purpose:
Reduce the required minimum scale division value for coupled-in-motion railroad weighing systems that are not used for static reference weighing.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

Table 3. ***Parameters for Accuracy Classes***			
Class	***Value of the Verification Scale Division (d or e[1])***	***Number of Scale[4] Divisions (n)***	
		Minimum	***Maximum***
SI Units			
I	*equal to or greater than 1 mg*	*50 000*	--
II	*1 to 50 mg, inclusive*	*100*	*100 000*
	equal to or greater than 100 mg	*5 000*	*100 000*
III[2,5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
	equal to or greater than 5 g	*500*	*10 000*
III L[3]	*equal to or greater than 2 kg*	*2 000*	*10 000*
IIII	*equal to or greater than 5 g*	*100*	*1 200*
U.S. Customary Units			
III[5]	*0.0002 lb to 0.005 lb, inclusive*	*100*	*10 000*
	0.005 oz to 0.125 oz, inclusive	*100*	*10 000*
	equal to or greater than 0.01 lb	*500*	*10 000*
	equal to or greater than 0.25 oz	*500*	*10 000*
III L[3]	*equal to or greater than 5 lb*	*2 000*	*10 000*
IIII	*greater than 0.01 lb*	*100*	*1 200*
	greater than 0.25 oz	*100*	*1 200*

[1] For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.

[2] A Class III scale marked "For prescription weighing only" may have a verification scale division (e) not less than 0.01 g.
(Added 1986) (Amended 2003)

[3] The value of a scale division for crane and hopper (other than grain ***hopper*** **and coupled-in-motion railroad weighing systems (not used for static reference weighing)** *scales shall be not less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall be not less than 1000.*

[4] On a multiple range or multi-interval scale, the number of divisions for each range independently shall not exceed the maximum specified for the accuracy class. The number of scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range. On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.
(Added 1997)

[5] The minimum number of scale divisions for a Class III Hopper Scale used for weighing grain shall be 2000.)

[*Nonretroactive as of January 1, 1986*]
(Amended 1986, 1987, 1997, 1998, 1999, 2003, and 2004)

Background/Discussion: See Appendix A, Page S&T-A23.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-5 D Table 3, Parameters for Accuracy Classes (See related items 3100-1 and 3600-2)

Source:
Ross Andersen, Retired (2017)

Purpose:
Address application of the code requirements across multiple devices.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

Table 3.
Parameters for Accuracy Classes

Class	*Value of the Verification Scale Division (d or e[1])*	*Number of Scale[4] Divisions (n)*	
		Minimum	*Maximum*
SI Units			
I	*equal to or greater than 1 mg*	*50 000*	--
II	*1 to 50 mg, inclusive*	*100*	*100 000*
	equal to or greater than 100 mg	*5 000*	*100 000*
III[2,5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
	equal to or greater than 5 g	*500*	*10 000*
III L[3]	*equal to or greater than 2 kg*	*2 000*	*10 000*
IIII	*equal to or greater than 5 g*	*100*	*1 200*
U.S. Customary Units			
III[5]	*0.0002 lb to 0.005 lb, inclusive*	*100*	*10 000*
	0.005 oz to 0.125 oz, inclusive	*100*	*10 000*
	equal to or greater than 0.01 lb	*500*	*10 000*
	equal to or greater than 0.25 oz	*500*	*10 000*
III L[3]	*equal to or greater than 5 lb*	*2 000*	*10 000*
IIII	*greater than 0.01 lb*	*100*	*1 200*
	greater than 0.25 oz	*100*	*1 200*

[1] For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.

[2] A Class III scale marked "For prescription weighing only" may have a verification scale division (e) not less than 0.01 g.
(Added 1986) (Amended 2003)

[3] The value of a scale division for crane and hopper (other than grain hopper) scales shall be not less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall be not less than 1000.

[4] On a multiple range or multi-interval scale, the number of divisions for each range independently shall not exceed the maximum specified for the accuracy class. The number of scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range. ***~~On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.~~***
(Added 1997, **Amended 20XX**)

[5] The minimum number of scale divisions for a Class III Hopper Scale used for weighing grain shall be 2000.)

[*Nonretroactive as of January 1, 1986*]
(Amended 1986, 1987, 1997, 1998, 1999, 2003, and 2004)

Background/Discussion: See Appendix A, Page S&T-A25.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-6 D N.1. Test Procedures

Source:
RAVAS Europe b.v. (2017)

Purpose:
Provide safe test procedures for 1-side supported mobile weighing systems such as forklift scales.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

N.1.1. Increasing-Load Test. – The increasing-load test shall be conducted on all scales with the test loads approximately centered on the load-receiving element of the scale **or for forklift scales approximately centered on the load-gravity point as prescribed by the typeplate of the truck,** except on a scale having a nominal capacity greater than the total available known test load. When the total test load is less than the nominal capacity, the test load is used to greatest advantage by concentrating it, within prescribed load limits, over the main load supports of the scale.

N.1.2. Decreasing-Load Test (Automatic Indicating Scales). – The decreasing-load test shall be conducted with the test load approximately centered on the load-receiving element of the scale **or for forklift scales approximately centered on the load-gravity point as prescribed by the typeplate of the truck.**

N.1.3.2. Equal-Arm Scales. – A shift test shall be conducted with a half-capacity test load centered successively at four points positioned equidistance between the center and the front, left, back, and right edges of each pan as shown in the diagrams below. An equal test load shall be centered on the other pan.

For forklift scales front and back shift test shall be conducted with a half-capacity test load centered successively at the front and back edges of the pallet. For safety reasons the shift test shall not be performed for the left and right sides of the pallet since the pallet is hanging in the air and has no support on those sides.

Background/Discussion: See Appendix A, Page S&T-A31.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-7 W T.1. General and T.N.2.1. General (See related items 3201-1, 3204-1, 3205-1, 3508-2, 3509-1 and 3600-4)

Source:
Ross Andersen, Retires (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Scales Code as follows**:**

> T.1. General. – **The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.** The tolerances applicable to devices not marked with an accuracy class shall have the tolerances applied as are as specified in Table T.1.1. Tolerances for Unmarked Scales.
>
> T.N.2.1. General. – The tolerance values are positive (+) and negative (-) **hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration** with the weighing device adjusted to zero at no load. When tare is used, the tolerance values are applied from the tare zero reference (zero net weight indication); the tolerance values apply to the net weight indication for any possible tare load using certified test loads.'
> (Amended 2008)

Background/Discussion: See Appendix A, Page S&T-A32.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3200-8 D T.N.3.6. Coupled-in-Motion Railroad Weighing Systems (See related item 3200-4)

Source:
Meridian Engineers Pty Ltd. (2017)

Purpose:
Align the acceptance tolerance values and assign accuracy classes for coupled-in-motion railroad weighing systems with OIML R 106-1 Edition 2011 (E) Automatic rail-weighbridges.

Item under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

T.N.3.6. Coupled-In-Motion Railroad Weighing Systems. ~~– The maintenance and acceptance tolerance values for the group of weight values appropriate to the application must satisfy the following conditions:~~

> ~~**T.N.3.6.1.** – For any group of weight values, the difference in the sum of the individual in-motion car weights of the group as compared to the sum of the individual static weights shall not exceed 0.2 %.~~
>
> ~~**T.N.3.6.2.** – If a weighing system is used to weigh trains of five or more cars, and if the individual car weights are used, any single weight value within the group must meet the following criteria:~~
>
> > ~~(a) no single error may exceed three times the static maintenance tolerance;~~
> > ~~(b) not more than 5 % of the errors may exceed two times the static maintenance tolerance; and~~
> > ~~(c) not more than 35 % of the errors may exceed the static maintenance tolerance.~~

~~(Amended 1990 and 1992)~~

~~**T.N.3.6.3.** For any group of weight values wherein the sole purpose is to determine the sum of the group, T.N.3.6.1. alone applies.~~
~~(Amended 1990)~~

~~**T.N.3.6.4.** For a weighing system used to weigh trains of less than five cars, no single car weight within the group may exceed the static maintenance tolerance.~~
~~(Amended 1990 and 1992)~~

T.N.3.6.1. Accuracy Classes - Systems are divided into four accuracy classes as follows:

0.2 0.5 1 2

A system may be in a different accuracy class for wagon weighing than that for train weighing.

T.N.3.6.2. Tolerance Values – The acceptance and maintenance tolerance values shall be as specified in Table T.N.3.6 below:

Accuracy Class	Table T.N.3.6. Percentage of mass of single wagon or train as appropriate	
	Acceptance Tolerance	Maintenance Tolerance
0.2	0.10%	0.20%
0.5	0.25%	0.50%
1	0.50%	1.00%
2	1.00%	2.00%

T.N.3.6.3. Wagon Weighing – The tolerance value for uncoupled or coupled wagon weighing shall be one of the following values, whichever is greater:

a) the value calculated according to the appropriate accuracy class in Table T.N.3.6., rounded to the nearest scale interval;

b) the value calculated according to the appropriate accuracy class in Table T.N.3.6., rounded to the nearest scale interval for the mass of a single wagon equal to 35 % of the maximum wagon mass (as inscribed on the descriptive markings); or

c) 1 *d*.

On initial verification of an instrument weighing coupled wagons, the errors of not more than 10 % of the weighing results taken from one or more passes of the test train may exceed the appropriate tolerance value given in Table T.N.3.6.but shall not exceed two times that value.

T.N.3.6.4. Train Weighing – The tolerance value for train weighing shall be one of the following values, whichever is greater:

a) the value calculated according to the appropriate accuracy class in Table T.N.3.6., rounded to the nearest scale interval;

b) the value calculated according to the appropriate accuracy class in Table T.N.3.6., for the mass of a single wagon equal to 35 % of the maximum wagon mass (as inscribed on the descriptive markings) multiplied by

the number of reference wagons in the train (not exceeding 10 wagons) and rounded to the nearest scale interval, or

c) 1 d for each wagon in the train but not exceeding 10 d.

Background/Discussion: See Appendix A, Page S&T-A34.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3201 BELT-CONVEYOR SCALE SYSTEMS

3201-1 W T.1. Tolerance Values (See related items 3200-7, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Belt-Conveyor Scale Systems Code as follows**:**

T.1. Tolerance Values.[1] - The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration. Maintenance and acceptance tolerances on material tests, relative to the weight of the material, shall be ±0.25% of the test load.

(Amended 1993)

[Note the ±is stricken near the end of the second sentence.]

Background/Discussion: See Appendix A, Page S&T-A35.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3202 AUTOMATIC BULK WEIGHING SYSTEMS

3202-1 D A. Application, S Specifications, N. Notes, UR. User Requirements

Source:
Kansas (2016)

Purpose:
Modernize the ABWS code to more fully the reflect the types of systems in use and technology available while still maintaining the safeguards of the current code.

Item under Consideration:
Amend NIST Handbook 44 Automatic Bulk Weighing Systems Code as follows:

A. Application

A.1. General. – This code applies to ~~automatic bulk~~ weighing systems, ~~that is, weighing systems~~ **capable of**~~adapted to the automatic~~ **automatically** weighing ~~of a commodity in~~ successive drafts of **a bulk commodity without human intervention.**~~predetermined amounts automatically recording the no load and loaded weight values and accumulating the net weight of each draft.~~
(Amended 1987)

S. Specifications

S.1. Design of Indicating and Recording Elements and Recorded Representations.

S.1.1. Zero Indication. – ~~Provisions~~ **An Automatic Bulk Weighing System (ABWS)** shall ~~be made to~~indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.

S.1.5. Recording Sequence. – ~~Provision~~ **An ABWS** shall ~~be made so that~~ **indicate** all weight values ~~are indicated~~ until ~~the completion of the~~ recording of the indicated value **is completed**.

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7 No Load Reference Values – An ABWS shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of human intervention must be required to restart the system after it is stopped.

S.1.8 Loaded Weight Values – An ABWS shall indicate and record loaded weight values for each weighment.

S.1.9 Net Weight Values – An ABWS shall calculate and record net weight for each weighment.

S.1.10 Net Weight Accumulation – An ABWS shall automatically accumulate and record the sum of all net weight values for each weighing process.

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. – ~~Provision~~ **An ABWS** shall ~~be made to~~ clearly indicate to the operator **product flow status** ~~the position of the gates leading directly~~ to and from the ~~weigh hopper~~**load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition that allows product to enter or leave the load receiving element. ~~leading directly to or from the weigh hopper is open.~~**

S.3.3. Overfill ~~Sensor~~And Interference Detection.

(a) **The system must have a means to detect when ~~T~~t**he **~~weigh hopper~~load-receiving element ~~shall be equipped with an~~is** overfill**ed. When an overfill condition exists ~~sensor which will cause the feed~~product flow to the load receiving element must be stopped, ~~gate to close,~~**an alarm must activate,**~~activate an alarm, and inhibit~~** weighing **must be inhibited** until the overfill condition has been corrected**, and some type of human intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**
(Added 1993)

(b) **~~If the system is equipped with a~~Downstream storage devices and other equipment, permanent or temporary, ~~lower garner or surge bin, that garner shall also~~ which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of human intervention is required to restart the system.~~be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.**

[Nonretroactive as of January 1, 1998]
(Amended 1997)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic **~~grain~~** bulk**~~-~~** weighing systems installed after January 1, 1984 **used to weigh grain**; and

UR. User Requirements

UR.4. System Modification. – **Components of ~~T~~t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.
(Amended 1991)

Background/Discussion: See Appendix A, Page S&T-A37.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3204 AUTOMATIC WEIGHING SYSTEMS

3204-1 W T.N.2.1. General (See related items 3200-7, 3201-1, 3205-2, 3508-2, 3509-1 and 3600-4)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Automatic Weighing Systems Code as follows**:**

> **T.N.2.1. General.** – The tolerance values ~~**are positive (+) and negative (-)**~~ **hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration** with the weighing device adjusted to zero at no load. When tare is used, the tolerance values are applied from the tare zero reference (zero net weight indication); the tolerance values apply to the net weight indication for any possible tare load using certified test loads.'
>
> (Amended 2008)

Background/Discussion: See Appendix A, Page S&T-A41.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3205 WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

3205-1 I A. Application. and Sections Throughout the Code to Address Commercial and Law Enforcement Applications

Source:
Rinstrum, Inc. and Right Weigh Innovations (2016)

Purpose:
To recognize a higher accuracy class and appropriate requirements in the Weighing-In-Motion Tentative Code to add commercial and law enforcement applications. In particular, scales meeting the higher accuracy classes would be permitted for use in commercial applications and for highway law enforcement.

Item under Consideration:
There is no specific proposal under consideration at this time. The submitter's original proposal has been removed from this part of the report at the submitter's request and is now included as part of the Background/Discussion for this item. The following synopsis was developed by the submitter of the item following the 2016 NCWM Annual Meeting to replace the original proposal that earlier appeared in this section of the report:

> Rinstrum and Right Weigh Innovation submitted a proposal last year to modify the tentative WIM Code for Screening and Sorting. The idea was to keep all WIM applications within the same Code section of Handbook 44. Rinstrum proposed to add slow-speed devices to the existing Screening and Sorting Code with two separate applications; one for commercial legal-for-trade and one for direct law enforcement. In consideration of the changes proposed, there would be three different applications covered by the same Code, which was causing some confusion. Because of the legal-for-trade application, it was suggested that that modification probably belonged in the Scales Code.
>
> The 2016 NCWM Interim Meeting saw Rinstrum request the NCWM President to form a WIM Task Group to bring together regulators and private sector stakeholders to discuss Weigh-In-Motion technology. Rinstrum sought "Developmental Status" so that it could maintain ownership of the proposal and continue to work on its development. A WIM Task Group has been formed, currently with 18 members representing Federal, State and Private Sector stakeholders. Technical advisors from NIST and NTEP contribute to the strength of the WIM Task Group. If you are interested in WIM technology, we will gladly add you to the WIM Task Group membership.
>
> The WIM Task Group is conducting regular meetings and following an agenda to analyze the device performance and create suitable Code that is well reasoned and appropriate for inclusion in Handbook 44. The first action of the WIM Task Group was to order an evaluation by the State of Illinois at an existing installation site to confirm the device meets Class IIIL tolerance. Next a decision was made to separate the Commercial Application from the Law Enforcement Application and to focus on the Commercial Application first. The Task Group will evaluate the requirement for use of reference test load vs. using the scale under test as a reverence. Consideration will be given to axle weight fluctuations as a result of suspension movement and what tolerance should be applied. Additional items on the agenda include the use of a single tolerance and creation of a Test Procedure and NTEP checklist. A sample of language to modify the Scales Code is currently being circulated within the Task Group for review and comments. The Task Group is engaged in this process and is thoroughly vetting the ideas and proposals presented so that it can make appropriate recommendations to the conference.

Rinstrum manufacturers the axleWEIGHr in-motion scale, which is a slow speed WIM axle scale system capable of being able to perform to within Class IIIL maintenance tolerance, according to Rinstrum. Rinstrum has indicated that the axleWEIGHr is a niche product, which creates a new segment for axle weighing devices. The axleWEIGHr calculates the GVW and weighs individual axles while a truck crosses the scale at 1-3 MPH. Rinstrum has also indicated the most common applications for its device will be agricultural farmers, small trucking companies or manufacturers that are interested to determine GVW and axle weights before the vehicle enters the public roadway.

Background/Discussion: See Appendix A, Page S&T-A42.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3205-2 W T.1.1. Design (See related items 3200-7, 3201-1, 3204-1, 3508-2, 3509-1 and 3600-4)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Automatic Weighing Systems Code as follows**:**

> **T.1.1. Design.** - The tolerances for a weigh-in-motion system is a performance requirement independent of the design principle used. **The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration**.

Background/Discussion: See Appendix A, Page S&T-A52.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3300 LIQUID MEASURING DEVICES

3300-1 V S.2.1. Vapor Elimination (See related items 3301-1, 3305-1, 3306-1 and 3307-1)

Source:
Liquid Controls and NIST OWM (2017)

Purpose:
Align other measuring device codes with the changes adopted in S&T LPG & NH_3 Code Item 332-3 (S.2.1. Vapor Elimination).

Item under Discussion:
Amend NIST Handbook 44 Liquid-Measuring Devices Code as follows:

S.2. Measuring Elements.

S.2.1. Air/Vapor Elimination. -

~~(a)~~ A **~~liquid-measuring device~~** **measuring system** shall be equipped with a**n effective** **~~vapor or~~** air**/vapor** eliminator or other automatic means to prevent the passage of **~~vapor and~~** air**/vapor** through the meter. **~~(b)~~** Vent lines from the air**~~-or-~~/**vapor eliminator shall be made of **~~metal tubing or other rigid~~** **appropriate non-collapsible** material.

(Amended 1975 **and 2017**)

S.2.1.1. Air/Vapor Elimination on Loading Rack ~~Metering~~ Measuring Systems.

(a) A loading rack **~~metering~~** **measuring** system shall be equipped with **~~a vapor or air~~** **an effective air/vapor** eliminator or other automatic means to prevent the passage of **air/**vapor and air through the meter unless the system is designed or operationally controlled by a **means ~~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**~~ **appropriate non-collapsible** material.

(Added 1994) **(Amended 2017)**

Background/Discussion: See Appendix A, Page S&T-A54.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3300-2 V UR.3.4. Printed Ticket

Source:
Morrow County, OH (2017)

Purpose:
Require that printed receipts declares an alpha or numeric pump designation that coincides with the dispensing device used for a specific transaction.

Item under Discussion:
Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

UR.3.4. Printed Ticket. – **This requirement applies only to devices that are capable of issuing a printed ticket.** The total price, the total volume of the delivery, **a corresponding alpha or numeric dispenser designation** and the price per liter or gallon shall be shown, either printed by the device or in clear hand script, on any printed ticket issued by a device and containing any one of these values.
(Amended 2001 **and 2017)**

Background/Discussion: See Appendix A, Page S&T-A56.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3300-3 W Recognized the Use of Digital Density Meters

Source:
Missouri (2016)

Purpose:
Allow the use of digital density meters for inspections of meter for viscous fluids such as motor oils, diesel exhaust fluid (DEF) and antifreeze.

Item under Discussion:
Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

Develop provisions in various LMD Codes of Handbook 44 that would recognize the use of digital density meters in lieu of volumetric provers, or the use of flasks and thermometers in the case of gravimetric testing) when testing meters used to dispense certain viscous fluids such as motor oil, DEF, antifreeze, syrups, etc.

"Digital density meters may be a solution for testing motor oil, DEF and anti-freeze meters."

Background/Discussion: See Appendix A, Page S&T-A57.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3301 VEHICLE-TANK METERS

3301-1 V S.2.1. Vapor Elimination (See related items 3300-1, 3305-1, 3306-1 and 3307-1)

Source:
Liquid Controls and NIST OWM (2017)

Purpose:
Align other measuring device codes with the changes adopted in S&T LPG & NH_3 Code Item 332-3 (S.2.1. Vapor Elimination).

Item under Discussion:
Amend NIST Handbook 44 Vehicle-Tank Meters Code as follows:

S.2. Design of Measuring Elements.

S.2.1. Air/Vapor Elimination. – A ~~**metering**~~ **measuring** system shall be equipped with an effective ~~**vapor or**~~ air**/vapor** eliminator or other automatic means to prevent the passage of ~~**vapor and**~~ air**/vapor** through the meter. Vent lines from the air~~**-or/**~~vapor eliminator shall be made of ~~**metal tubing or some other suitable rigid**~~ **appropriate non-collapsible** material.
(Amended 1993) **(Amended 2017)**

Background/Discussion: See Appendix A, Page S&T-A59.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3301-2 D S.3.7. Manifold Hose Flush System

Source:
New York (2016)

Purpose:
Recognize the use of hose flush systems in the HB 44 VTM code**.**

Item under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

S.3.7. Manifold Hose Flush System. – A hose flush system to clear the hose of product may be installed in the manifold when multiple products are dispensed through a single meter and hose under the following conditions:

(a) the inlet valves for the system are conspicuously located above the bottom framework of the truck; and

(b) the inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use; and

(c) the discharge hose remains of the wet hose type; and

(d) the direction of flow for which the system may be set at any time is definitely and conspicuously indicated; and

(e) a recorded representation of each flush is maintained for inspection.

Background/Discussion: See Appendix A, Page S&T-A61.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3301-3 V S.5.7. Meter Size

Source:
City of Madison, Wisconsin (2017)

Purpose:
Remove a marking requirement that is no longer necessary due to changes in the product depletion test tolerance**.**

Item under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

~~***S.5.7. Meter Size. – Except for milk meters, if the meter model identifier does not provide a link to the meter size (in terms of pipe diameter) on an NTEP Certificate of Conformance, the meter shall be marked to show meter size.***~~

~~***[Nonretroactive as of January 1, 2009]***~~
~~**(Added 2008)**~~

Background/Discussion: See Appendix A, Page S&T-A66.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3301-4 W N.4.X. Automatic Stop Mechanism, T.X. Automatic Stop Mechanism and UR.2.6. Automatic Stop Mechanism

Source:
City of Madison, Wisconsin (2017)

Purpose:
Incorporate the automatic stop mechanism test requirement in NIST Handbook 112 EPO 23 Vehicle-Tank Meters, Power Operated into Handbook 44 so that it is enforceable**.**

Item under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

N.4.X. Automatic Stop Mechanism. - The automatic stop mechanism shall stop the flow within one-half the minimum interval indicated.

T.X. Automatic Stop Mechanism. - The automatic stop mechanism shall stop the flow within one-half the minimum interval indicated.

U.R.2.6. Automatic Stop Mechanism. - The automatic stop mechanism shall stop the flow within one-half the minimum interval indicated.

Background/Discussion: See Appendix A, Page S&T-A67.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3302 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

3302-1 V N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item under Consideration:
Amend NIST Handbook 44 LPG and Anhydrous Ammonia Liquid-Measuring Devices as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982 **and 2017**)

N.3.2. Transfer Standard Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.

Background/Discussion: See Appendix A, Page S&T-A67.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3302-2 D N.4.1.2. Repeatability Tests and N.4.2.4. Repeatability Tests for Type Evaluation

Source:
Ross Andersen, Retired (2017)

Purpose:
Address differences between Handbook44 and Publication 14 practices for LPG Liquid Meter testing.

Item under Consideration:
Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

> **N.4.1.2. Repeatability Tests. –** Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained. **Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Both field tests and type evaluation tests shall be run at flow rates consistent with normal tests as specified in N.4.1.**
> **(amended 20XX)**
>
> Add a new Paragraph N.4.2.4. as follows:
>
> **N.4.2.4. Repeatability Tests for Type Evaluation. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained. Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Type evaluation tests shall be run at flow rates consistent with special tests as specified in N.4.2., N.4.2.1., N.4.2.2,, or N.4.2.3. as appropriate.**
> **(Added 20XX)**

Background/Discussion: See Appendix A, Page S&T-A75.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3302-3 V N.4.2.3. For Wholesale Devices

Source:
NIST Office of Weights and Measures (2016)

Purpose:
1) To specify the purpose of special tests conducted on Wholesale LPG and Anhydrous Ammonia Liquid-Measuring Devices;
2) To specify that the special tests are to be conducted at or slightly above the designated flow rates in the referenced paragraph; and
3) To specify that the special tests are not to be conducted below the device's marked minimum discharge rate.

Item under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

N.4.2.3. ~~For~~ Wholesale Devices. – **"Special" tests on ~~A~~ a** wholesale device shall **include a test at or slightly above the minimum discharge rate marked on the device.** ~~**be so tested at a minimum discharge rate of:**~~

~~(**a) 40 L (10 gal) per minute for a device with a rated maximum discharge less than 180 L (50 gal) per minute.**~~

~~**(b) 20 % of the marked maximum discharge rate for a device with a rated maximum discharge of 180 L (50 gal) per minute or more, or**~~

~~**(c) the minimum discharge rate marked on the device, whichever is least.**~~

In no case shall the test be performed at a flow rate less than the minimum discharge rate marked on the device.

(Amended 1987 **and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A76.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3305 MILK METERS

3305-1 V S.2.1. Vapor Elimination (See related items 3300-1, 3301-1, 3306-1 and 3307-1)

Source:
Liquid Controls and NIST OWM (2017)

Purpose:
Align other measuring device codes with the changes adopted in S&T LPG & NH_3 Code Item 332-3 (S.2.1. Vapor Elimination).

Item under Discussion:
Amend NIST Handbook 44 Milk Meters Code as follows:

S.2. Design of Measuring Elements.

S.2.1. Air/Vapor Elimination. – A ~~**metering**~~ **measuring** system shall be equipped with an effective **air/**vapor eliminator or other ~~**effective means**~~ automatic **means** ~~**in operation**~~ to prevent the passage of **air/**vapor ~~**and air**~~ through the meter. Vent lines from the air~~**-or-**~~/vapor eliminator shall be made of ~~**metal tubing or some other suitably rigid material**~~ **appropriate non-collapsible material.**
(Amended 2017)

Background/Discussion: See Appendix A, Page S&T-A78.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3306 WATER METERS

3306-1 V S.2.2.1. Air Elimination (See related items 3300-1, 3301-1, 3305-1 and 3307-1)

Source:
Liquid Controls and NIST OWM (2017)

Purpose:
Align other measuring device codes with the changes adopted in S&T LPG & NH_3 Code Item 332-3 (S.2.1. Vapor Elimination).

Item under Discussion:
Amend NIST Handbook 44 Water Meters Code as follows:

S.2.2. Batching ~~Meters~~Measuring Systems Only.

S.2.2.1. Air/Vapor Elimination, Batching Measuring Systems. – Batching **~~meters~~measuring systems** shall be equipped with an effective air**/vapor** eliminator **or other automatic means to prevent the passage of air/vapor through the meter. Vent lines from the air/vapor eliminator shall be made of appropriate non-collapsible material.**
(Amended 2017)

Background/Discussion: See Appendix A, Page S&T-A79.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3307 MASS FLOW METERS

3307-1 V S.3.3. Vapor Elimination (See related items 3300-1, 3301-1, 3305-1 and 3306-1)

Source:
Liquid Controls and NIST OWM (2017)

Purpose:
Align other measuring device codes with the changes adopted in S&T LPG & NH_3 Code Item 332-3 (S.2.1. Vapor Elimination).

Item under Discussion:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

S.3.3. Air/Vapor Elimination. – A **~~liquid measuring instrument or~~** measuring system shall be equipped with an effective **air/**vapor **~~or air~~** eliminator or other **~~effective~~ automatic** means**~~, automatic in operation,~~** to prevent the **~~measurement~~ passage** of **air/**vapor **~~and air~~ through the meter**. Vent lines from the air**/~~or~~** vapor eliminator shall be made of **~~metal tubing or some other suitable rigid~~ appropriate non-collapsible** material.

(Amended 1999 **and 2017**)

S.3.3.1. **Air/**Vapor Elimination on Loading Rack Liquid ~~**Metering**~~ **Measuring** Systems.

(a) A loading rack ~~**liquid metering**~~ **measuring** system shall be equipped with a**n effective air/**vapor ~~**or air**~~ eliminator or other automatic means to prevent the passage of **air/**vapor ~~**and air**~~ through the meter**.** unless the system is designed or operationally controlled by a **means** ~~**method, approved by the weights and measures jurisdiction having statutory authority over the device,**~~ such that neither air nor vapor can enter the system.

(b) Vent lines from the air**/** ~~**or**~~ vapor eliminator ~~**(if present)**~~ shall be made of ~~**metal tubing or other rigid**~~ **appropriate non-collapsible** material.

(Added 1995) **(Amended 2017)**

Background/Discussion: See Appendix A, Page S&T-A80.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3307-2 V N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - The minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. More tests may be performed at these or other flow rates. (See T.3. Repeatability.)
(Amended 1982)

N.3.2. Transfer Standard Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.

Background/Discussion: See Appendix A, Page S&T-A82.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3504 TAXIMETERS

3504-1 V A.2. Exceptions. (See related item 3600-6)

Source:
USNWG on Taximeters (2017)

Purpose:
Clarify that the Taximeters Code does not apply to Transportation Network Measuring Systems, which would fall under a new tentative code specifically for those systems.

Item under Consideration:
Amend NIST Handbook 44 Taximeter Code as follows:

A.2. Exceptions. – This code does not apply to;

a) Odometers on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers)

b) Devices that only display a flat rate or negotiated rate**.; or**

c) Transportation Network Measurement Systems (for which see Section 5.XX Transportation Network Measurement Systems).

(Amended 1977 **and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A84.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3504-2 V USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System-Based Systems for Time and Distance Measurement

Note: This item was originally titled "Item 360-5 S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda. At the 2013 NCWM Interim Meeting, the Committee combined that item with "Item 354-1 Global Positioning Systems for Taximeters" and "Item 360-6 Global Positioning Systems for Taximeters" to create this new, consolidated item to address the development of recommendations on multiple topics related to taximeters and GPS-based time and distance measuring systems.

Source:
NIST USNWG on Taximeters

Purpose:
Revise the Taximeters Code to be applicable and appropriate for current technology and eliminate disparities between this code and the newly proposed Transportation Network Measuring Systems Code.

Item under Consideration:
Amend NIST Handbook 44 Taximeters Code as follows:

Section 5.54. Taximeters

A. Application

A.1. General. – This code applies to taximeters; that is, to devices that automatically calculates at a predetermined rate or rates and indicate the charge for hire of a vehicle.

A.2. Exceptions. – This code does not apply to:

(a) Odometers on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).
(b) Devices that only display a flat rate or negotiated rate.
(c) **Transportation Network Measurement Systems (for which see Section 5.XX. Transportation Network Measurement Systems).**

(Amended 1977**,** ~~and~~ 2016**, and 20XX**)

A.3. Additional Code Requirements. – In addition to the requirements of this code, Taximeters shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements.

S.1.1. General. – A taximeter shall be equipped with a primary indicating element.

(Amended 1988 and 2015)

S.1.1.1. Recording Elements. *– A receipt providing information as required in S.1.9. Recorded Representations shall be available from a taximeter or taximeter system through an integral or separate recording element for all transactions conducted.*
[Nonretroactive January 1, 2016]

(Added 2015)

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism.

At the conclusion of a transaction (e.g., following the totalizing of all accrued charges and having a customer receipt made available), no other advancement of fare, extras or other charges shall occur until the taximeter has been cleared.
[Nonretroactive as of January 1, 2017]

Where permitted, a flat rate or negotiated rate shall be displayed in the "fare" indicating mechanism, provided that once a flat rate or negotiated rate is entered the fare may no longer be advanced by movement of the vehicle or the time mechanism.

(Amended 1988 and 2016)

S.1.2.1. Time Mechanism. – Means shall be provided on all taximeters designed to calculate fares based on a combination of time elapsed and distance traveled, to enable the vehicle operator to render the time mechanism either operative or inoperative with respect to the fare-indicating mechanism.

(Added 20XX)

S.1.2.2. Distance Mechanism. – Means shall be provided on all taximeters designed to calculate fare based on a combination of time elapsed and/or distance traveled to enable the vehicle operator to render the distance mechanism either operative or inoperative with respect to the fare-indicating mechanism.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

S.1.3. Visibility of Indications.

S.1.3.1. Taximeter Indications. – The indications of fare, including extras, and the mode of operation, such as "time" or "hired," shall be constantly displayed whenever the meter is in operation. All indications of passenger interest shall be easily read from a distance of 1.2 m (4 ft) under any condition of normal operation. **This includes any necessary lighting, shading or other means necessary to make displayed indications clearly visible to operator and passenger.**

(Amended 1977, 1986, ~~and~~ 1988 **and 20XX**)

S.1.3.~~1~~2. Minimum Height of Figures, Words, and Symbols. – The minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

(Added 1986)

~~***S.1.3.2. Lighting of Indications. Integral lighting shall be provided to illuminate the fare, extras, the rate or rate code, and the taximeter status (i.e., vacant, hired, and time off).***~~
~~***[Nonretroactive as of January 1, 1989]***~~

~~**(Added 1988) (Amended 1990)**~~

S.1.3.3. Passenger's Indications. *– A supplementary indicating element installed in a taxi to provide information regarding the taxi service to the passenger* ***(i.e., Passenger Information Monitor or PIM)****, shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display (unless disabled by the passenger) at all times during the transaction.*
[Nonretroactive as of January 1, 2016]

(Added 2015) **(Amended 20XX)**

S.1.3.3.1. Additional Information. *– Additional information shall be displayed or made available through a passenger's indicating element (as described in S.1.3.3. Passenger's Indications) and shall be current and reflect any charges that have accrued. This additional information shall include:*

(a) an itemized account of all charges incurred including fare, extras, and other additional charges; and

(b) the rate(s) in use at which any fare is calculated.

Any additional information made available must not obscure the accruing total of charges for the taxi service. This additional information may be made accessible through clearly identified operational controls (e.g., keypad, button, menu, touch-screen).
[Non retroactive as of January 1, 2016]

(Added 2015)

S.1.3.3.2. Fare and Extras Charges. *– The indication of fare and extras charges on a passenger's indicating element shall agree with similar indications displayed on all other indicating elements in the system.*

[Nonretroactive as of January 1, 2016]

(Added 2015)

S.1.4. Actuation of Fare-Indicating Mechanism. – When a taximeter designed to calculate fares upon the basis of a combination of distance traveled and time elapsed **but not both time and distance used concurrently to calculate fare,** is operative with respect to fare indication, the fare-indicating mechanism shall be actuated by the distance mechanism whenever the vehicle is in motion at such a speed that the rate of distance revenue equals or exceeds the time rate, and may be actuated by the time mechanism whenever the vehicle speed is less than this and when the vehicle is not in motion. ~~**Means shall be provided for the vehicle operator to render the time mechanism either operative or inoperative with respect to the fare-indicating mechanism.**~~

(Amended 1977 **and 20XX**)

S.1.5. Operating Condition.

S.1.5.1. General. – When a taximeter is cleared, the indication "Not Registering," "Vacant," or an equivalent expression shall be shown. Whenever a taximeter is set to register charges, it shall indicate "Registering," "Hired," or an equivalent expression and the rate at which it is set shall be automatically indicated (Rate 1 or Rate A, for example).

(Amended 1988)

S.1.5.2. Time not Recording. – When a taximeter is set for fare registration with the time mechanism inoperative, it shall indicate "Time Not Recording" or an equivalent expression.

(Amended 1988)

S.1.5.3. Distance not Recording. - When a taximeter is set for fare registration with the distance mechanism inoperative, it shall indicate "Distance Not Recording" or an equivalent expression.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

S.1.6. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.7. Extras. – Extras shall be indicated as a separate item and shall not be included in the fare indication. They shall be identified by the word "Extras" or by an equivalent expression. Values shall be defined by suitable words or monetary signs. Means may be provided to totalize the fare and extras if the totalized amount returns to separate indications of fare and extras within 5 seconds or less.

(Amended 1988)

S.1.7.1. Nonuse of Extras. – If and when taximeter extras are prohibited by legal authority or are discontinued by a vehicle operator, the extras mechanisms shall be rendered inoperable or the extras indications shall be effectively obscured by permanent means.

S.1.8. Protection of Indications. – All indications of fare and extras shall be protected from unauthorized alteration or manipulation.

(Amended 2015)

S.1.9. Recorded Representation. *– A printed* ***or electronic*** *receipt issued from a taximeter, whether through an integral or separate recording element, shall include as a minimum, the following information when processed through the taximeter system:*

(a) date;

*(b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN), permit number, or other identifying information as specified by the statutory authority;**

*(c) start and end time of the trip;**

*(d) distance traveled, maximum increment of 0.1 km (0.1 mi);**

(e) fare in $;

*(f) each rate at which the fare was computed and the associated fare at that rate;**

*(g) additional charges (in $) where permitted such as extras, any surcharges, telecommunication charges, and taxes shall be identified and itemized;**

*(h) total charge for service in $ (inclusive of fare, extras, and all additional charges);**

*(i) trip number, if available;*** ~~***and***~~

*(j) telephone number (or other contract information) for customer assistance~~.~~**;**** ***and***

(k) a statement of chargeable time and chargeable distance for taximeters that calculate fare using time and distance concurrently.**

Note: When processed through the taximeter or taximeter system, any adjustments (in $) to the total charge for service including discounts, credits, and tips shall also be included on the receipt.**

*[Nonretroactive as of January 1, 1989] *[Nonretroactive as of January 1, 2000]*
[Nonretroactive as of January 1, 2016]* ***[Nonretroactive as of January 1, 20XX]

(Added 1988) (Amended 1999 and 2015)

S.1.9.1. Multiple Recorded Representations.

S.1.9.1.1. Duplicate Receipts. *– A recording element may produce a duplicate receipt for the previous transaction provided the information printed is identical to the original with the exception of time issued. The duplicate receipt shall include the words "duplicate" or "copy." The feature to print a duplicate receipt shall be deactivated at the time the meter is hired for the next fare.*
[Nonretroactive as of January 1, 2000]

(Added 1999)

S.1.10. Non-fare Information. *– The fare and extras displays may be used to display auxiliary information provided the meter is in the vacant condition and such information is only displayed for10 seconds, or less. If the information consists of a list of information, the list may be displayed one item after another, provided that each item is displayed for 10 seconds, or less.*
[Nonretroactive as of January 1, 2002]

(Added 2000)

S.2. Basis of Fare Calculations. – A taximeter shall calculate fares only upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

A taximeter may utilize more than one rate to calculate the fare during a trip. Any change in the applied rate must occur at the completion of the current interval.

(Amended 1977 and 2016)

S.2.1. Initial Time and Distance Intervals. – The time and distance intervals of a taximeter **that does not calculate fares based on distance travelled and time elapsed used concurrently** shall be directly proportional as expressed in the following formula:

$$\frac{Seconds\ of\ \ Initial\ Time\ Interval}{Seconds\ per\ Non-Initial\ Time\ Interval} = \frac{Distance\ of\ \ Initial\ Mileage\ Interval}{Distance\ per\ Non-Initial\ Mileage\ Interval}$$

(Added 1990) **(Amended 20XX)**

S.3. Design of Operating Control.

S.3.1. Positions of Control. – The several positions of the operating controls shall be clearly defined and shall be so constructed that accidental or inadvertent changing of the operating condition of the taximeter is improbable. Movement of the operating controls to an operating position immediately following movement to the cleared position shall be delayed enough to permit the taximeter to come to a complete rest in the cleared position.

(Amended 1988)

S.3.2. Control for Extras Mechanism. – The knob, handle, or other means provided to actuate the extras mechanism shall be inoperable whenever the taximeter is cleared.

S.4. Interference. – The design of a taximeter shall be such that **when a fare is calculated by using time and/or by using distance (but not used concurrently)** there will be no interference between the time and the distance portions of the mechanism device at any speed of operation.

(Amended 1977**,** ~~**and**~~ 1988 **and 20XX**)

~~**S.5. Provision for Security Seals. Adequate provision shall be made to provide security for a taximeter. Security may be provided either by:**~~

~~**(a) Affixing security seals to the taximeter and to all other components required for service operation of a complete installation on a vehicle, so that no adjustments, alterations, or replacements affecting accuracy or indications of the device or the assembly can be made without mutilating the seal or seals; or**~~

~~**(b) Using a combination of security seals described in paragraph (a) and, in the case of a component that may be removed from a vehicle (e.g., slide mounting the taximeter), providing a physical or electronic link between components affecting accuracy or indications of the device to ensure that its performance is not affected and operation is permitted only with those components having the same unique properties.**~~

~~**The sealing means shall be such that it is not necessary to disassemble or remove any part of the device or of the vehicle to apply or inspect the seals.**~~

~~**(Amended 1988 and 2000)**~~

S.5. Provisions for Security Sealing. - Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that requires the security seal to be broken before an adjustment or interchange can be made of:

(a) any metrological parameter affecting the metrological integrity of the taximeter and associated equipment; or

(b) any metrological parameter controlled by software residing in the taximeter or an associated external computer network.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

[Audit trails shall use the format set forth in Table S.5.]

S.5.1. Taximeters Connected to Networked Systems. - Metrological features that are not located on the taximeter device installed in the vehicle (i.e., accessed through a computer network, server, or "cloud") shall be secured by means that will:

(a) protect the integrity of metrological data and algorithms used to compute fares from such data against unauthorized modification; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data and algorithms used to compute fares from such data only to authorized persons.

S.5.2. Taximeters Calibrated to Specific Vehicles. - In the case of taximeters where the proper performance and calibration of the device has been verified when used in a specific vehicle and which may be removed from the vehicle (e.g., slide mounting the taximeter), means shall be provided through a physical seal or electronic link between components affecting accuracy or indications of the device to ensure that its performance is not affected and operation is permitted only with those components having the same unique properties.

Table S.5. Categories of Devices and Methods of Sealing	
Categories of Device	***Methods of Sealing***
Category 1: No remote configuration capability.	***Seal by physical seal or a combination of physical seals and for components that may be removed from the vehicle, a physical or electronic link as described in S.5.3. Taximeters Calibrated to Specific Vehicles***
Category 2: Remote access to adjustable parameters, but access is controlled by physical hardware. ***The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode. The device shall not operate as normal when in the configuration mode.***	***The hardware enabling access for remote access to calibration functions must be at the device and sealed using a physical seal and also include an event logger.*** ***An event logger must also be used to record changes to configuration parameters made through remote access.*** ***The event loggers must include event counters (minimum count of 1000 events), the parameter ID, the date and time of the change, and the new value of the parameter. A printed or electronic copy of the information must be available through the device. The event loggers shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required.*** ***(Note: Does not require 1000 changes to be stored for each parameter.)***
Category 3: Remote access to adjustable parameters. ***Remote access to adjustable parameters may be unlimited or controlled through a software switch (e.g., password).*** ***The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode. The device shall not operate as normal when in the configuration mode.***	***An event logger must also be used to record changes to adjustable parameters that are made through remote access and which is accessible only by authorized persons (using an internet web browser or other such secure software.*** ***The event logger shall include event counters, the date and time of the change, the parameter ID and the new value of the parameter. A printed or electronic copy of the information must be available through the device. The event loggers shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required.*** ***(Note: Does not require 1000 changes to be stored for each parameter.)*** ***The device shall become inoperable when access to the system's metrological parameters is made through unapproved or unauthorized means. The device shall remain inoperable until cleared by the official having statutory authority.***

[Nonretroactive as of January 1, 20XX]

S.6. Power Interruption, Electronic Taximeters.

(a) After a power interruption of 3 seconds or less, the fare and extras indications shall return to the previously displayed indications and may be susceptible to advancement without the taximeter being cleared.

(b) After a power interruption exceeding 3 seconds, the fare and extras indications shall return to the previously displayed indications and shall not be susceptible to advancement until the taximeter is cleared.

*After restoration of power following an interruption exceeding 3 seconds, the previously displayed fare shall be displayed for a maximum of 1 minute at which time the fare shall automatically clear and the taximeter shall return to the vacant condition.**
*[*Nonretroactive as of January 1, 2002]*
(Added 1988) (Amended 1989, 1990, and 2000)

S.7. Measurement Signal Loss. – In the event that the measurement signal is interrupted, the taximeter shall be capable of determining any information needed to complete a transaction in progress at the time of signal loss/interruption.

Note: If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time if the time mechanism is not affect by signal loss.

S.7.1. Intermittent Trip Data Loss. – When the measurement signal is lost intermittently during a trip (e.g., traveling through a tunnel) but recovered prior to the end of the trip, the taximeter shall be capable of calculating an accurate fare in accordance with T.1. Tolerance Values.

S.7.2. Significant Trip Data Loss. – When the signal is lost for a significant portion of the trip, the taximeter shall calculate the total charge utilizing recorded time and distance measurements and other charges (e.g., tolls and airport fees), and may also include other means in accordance with the terms of service (or other agreement) the passenger has agreed to.

Note: Significant trip data loss refers to instances when the measurement signal is lost to the extent that the taximeter cannot perform an accurate measurement or when the signal is not regained by the end of the trip.

(Added 20XX)

S.~~7~~8. Anti-Fraud Provisions, Electronic Taximeters. – An electronic taximeter may have provisions to detect and eliminate distance input that is inconsistent with **~~output of the vehicle's distance sensor~~the taximeters's source(s) of distance measurement data**. When a taximeter equipped with this feature detects input inconsistent with the distance **~~sensor~~measurement data source(s)**:

(a) The meter shall either filter out the inconsistent distance input signals or cease to increment fare based on distance until the distance input signal **~~returns to normal~~ is restored to normal operation**. If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time **where permitted by the statutory authority and if the time mechanism is not affected by inconsistent signals**;

(b) The taximeter shall provide a visible or audible signal that inconsistent input signals are being detected; and

(c) The taximeter shall record the occurrence in an event logger. The event logger shall include an event counter **~~(000 to 999)~~**, the date, and the time of at least the last 1000 occurrences.

(Added 2001) **(Amended 20XX)**

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, a distance test of a taximeter shall be conducted utilizing one or more of the following test methods:

(a) **Road Test.** – A road test consists of driving the vehicle over a precisely measured road course.

(b) **Fifth-Wheel Test.** – A fifth-wheel test consists of driving the vehicle over any reasonable road course and determining the distance actually traveled through the use of a mechanism known as a "fifth wheel" that is attached to the vehicle and that independently measures and indicates the distance.

(c) **Simulated-Road Test*.** – A simulated road test consists of determining the distance traveled by use of a roller device, or by computation from rolling circumference and wheel-turn data.

*** Simulated-road testing is not appropriate for taximeters using measurement data from sources other than signal(s) generated by rotation of the wheels of the vehicle.**

(Amended 1977 **and 20XX**)

N.1.2. Test Procedures. – The distance test of a taximeter, whether a road test, a simulated-road test, or a fifth-wheel test, shall include at least duplicate runs of sufficient length to cover at least the third money drop or 1 mi, whichever is greater, and shall be at a speed approximating the average speed traveled by the vehicle in normal service. In the case of metric-calibrated taximeters, the test should cover at least the third money drop or 2 km, whichever is greater.

(Amended 1977)

N.1.2.1. Taximeters Using Measurement Data Sources From Other Than Rotation of the Wheels. – Repeatability testing shall be conducted if during testing a taximeter registers a distance measurement that does not comply with the tolerance values in T.1.1. Distance Tests. A minimum of three additional tests shall be conducted at the same location and where all test variables are reduced to the greatest extent practicable to verify the sytems ability to repeat transaction indications. Repeatability testing performed in excess of these three additional tests is done at the discretion of the official with statutory authority.

Testing of taximeters with metrologically significant parameters that do not completely reside within the taximeter device shall include tests performed under variable conditions to verify that any non-compliant issue is generated from a network system rather than a single taximeter device. The variability tests shall include a minimum of three consecutive tests of varying lengths, locations, and/or environmental conditions.

(Added 20XX)

N.1.3. Test Conditions.

N.1.3.1. Measurement Data Based on the Rotation of the Vehicle's Wheels. – For taximeters that receive input of measurement data generated (directly or indirectly) from rotation of the vehicle's wheels, the test of the taximeter shall be performed under the following conditions.

(Added 20XX)

N.1.3.1.1 Vehicle Lading. – During the distance test of a taximeter, the vehicle shall carry two persons, or in the case of a simulated-road test, 70 kg or 150 lb of test weights may be substituted in lieu of the second person.

N.1.3.1.2. Tire Pressure. – At the completion of test run or runs, the tires of the vehicle under test shall be checked to determine that the tire pressure is that operating tire pressure posted in the vehicle. If not, the tire pressure should be adjusted to the posted tire pressure and further tests may be conducted to determine the operating characteristics of the taximeter.

(Amended 1977 **and 20XX**)

N.1.3.2. Taximeters Using Other Measurement Data Sources. - Except during type evaluation, all tests shall be performed under conditions that are considered usual and customary for the location(s) where the system is normally operated and as deemed necessary by the statutory authority.

N.1.3.2.1. Roads. - All tests shall be conducted on public roads which are in good repair.

N.1.3.2.2 Testing for Environmental Influences. – During type evaluation, the distance test may be performed on a route traveled by the vehicle that exposes the system to conditions

possibly contributing to the loss of, or interference with the signal(s) providing measurement data. This may include:

a) Objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;

b) Routes that do not follow a straight-line path;

c) Significant changes in altitude; and

d) Any other relevant environmental conditions.

(Added 20XX)

N.2. Time Test. – If a taximeter is equipped with a timing device through which charges are made for time intervals, the timer shall be tested at the initial interval, four separate subsequent intervals, and an average time test of at least four consecutive subsequent time intervals.

(Amended 1988)

N.3. Interference Test. – ~~**If a taximeter is equipped with a timing device through which charges are made for time intervals**~~**For taximeters that calculate fares based on time and/or distance but not simultaneously**, a test shall be conducted to determine whether there is interference between the time and distance elements. During the interference test, the vehicle's operating speed shall be 3 km/h or 4 km/h, or 2 mi/h or 3 mi/h faster**, and then 3 km/h or 4 km/h (2mi/h or 3 mi/h) slower** than the speed at which the basic distance rate equals the basic time rate. The basic rate per hour divided by the basic rate per mile is the speed (km/h or mi/h) at which the basic time rate and basic distance rate are equal.

Note: Performance of the interference test may not be considered appropriate as a field test while travelling in a vehicle equipped with a taximeter. This test may be performed during type evaluation under controlled conditions for practicality and for safety concerns.

(Amended 1988 **and 20XX**)

T. Tolerances

T.1. Tolerance Values.

T.1.1. On Distance Tests. – Maintenance and acceptance tolerances for taximeters shall be as follows:

(a) On Overregistration: 1 % of the interval under test.

(b) On Underregistration: 4 % of the interval under test, with an added tolerance of 30 m or 100 ft whenever the initial interval is included in the interval under test.

T.1.2. On Time Tests.

T.1.2.1. On Individual Time Intervals. – Maintenance and acceptance tolerances on individual time intervals shall be as follows:

(a) On Overregistration: 3 seconds per minute (5 %).

(b) On Underregistration: 9 seconds per minute (15 %) on the initial interval, and 6 seconds per minute (10 %) on subsequent intervals.

T.1.2.2. On Average Time Interval Computed After the Initial Interval. – Except for the initial interval, maintenance and acceptance tolerances on the average time interval shall be as follows:

(a) On Overregistration: 0.2 second per minute (0.33 %).

(b) On Underregistration: 3 seconds per minute (5 %).

(Amended 1991)

T.1.3. On Interference Tests. - For taximeters designed to calculate fares upon the basis of a combination of distance traveled and time elapsed, but not using both simultaneously.

T.1.3.1. The **distance** registration of a taximeter in the "time on" position shall agree within 1 % of its ~~performance~~ **distance registration** in the "time off" position.

(Added 1988)

(Amended 20XX)

T.2. Tests Using Transfer Standards. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard (i.e., fifth-wheel) when compared to a basic reference standard.

(Added 20XX)

UR. User Requirements

UR.1. Inflation of Vehicle Tires. – **For taximeters that receive input of measurement data generated (directly or indirectly) from rotation of the vehicle's wheels,** ~~T~~**t**he operational tire pressure of passenger vehicles and truck tires shall be posted in the vehicle and shall be maintained at the posted pressure.

(Amended 1977 **and 20XX**)

UR.2. Position and Illumination of Taximeter. – A taximeter shall be so positioned and illuminated that its indications, operational markings, and controls of passenger interest can be conveniently read by a passenger seated ~~in the back seat of the vehicle~~ **in a position of up to 1.2 meters (4 ft.) away from the taximeter under any condition of normal operation.**

(Amended 1985**,** ~~and~~ 1986 **and 20XX**)

UR.3. Statement of Rates. – The distance and time rates for which a taximeter is set, including the initial distance interval and the initial time interval, the local tax rate, and the schedule of extras when an extras indication is provided shall be conspicuously displayed inside the front and rear passenger compartments. The words "Rate," "Rates," or "Rates of Fare" shall precede the rate statement. The rate statement shall be fully informative, self-explanatory, and readily understandable by the ordinary passenger, and shall either be of a permanent character or be protected by glass or other suitable transparent material.

(Amended 1977, 1988, 1990, and 1999)

Appendix D

location services. – any of the various technologies used to determine the geographical location of a receiving unit in or physically attached to a vehicle. These technologies may include but are not limited to: Global Positioning Service; cellular networks; wi-fi networks. [5.54., 5.XX.]

Background/Discussion: See Appendix A, Page S&T-A87.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3508 MULTIPLE DIMENSION MEASURING DEVICES

3508-1 V S.1.7. Minimum Measurement ~~Lengths~~ and S.1.8. Indications Below Minimum and Above Maximum

Source:
Multiple Dimension Measuring Device Work Group (2017)

Purpose:
Clarification of the application of the minimum measurement and tare operation.

Item under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code as follows:

S.1.7. Minimum Measurement ~~Lengths~~. – Except for entries of tare, the minimum **measurement** ~~length to be measured~~ by a device is 12 **d** ~~divisions~~. The manufacturer may specify a longer minimum **measurement** ~~length~~. **For multi-interval devices, this applies only to the first measuring segment.**

S.1.8. Indications Below Minimum and Above Maximum. – When objects are smaller than the minimum dimensions identified in paragraph S.1.7. Minimum **Measurement** ~~Lengths~~ or larger than any of the maximum dimensions plus 9 d, and/or maximum volume marked on the device plus 9 d, or when a combination of dimensions**, including tare,** for the object being measured exceeds the measurement capability of the device, the indicating or recording element shall either:
…

Background/Discussion: See Appendix A, Page S&T-A89.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3508-2 W T.3. Tolerance Values (See also items 3200-7, 3201-1, 3204-1, 3205-1, 3509-1 and 3600-4)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Multiple Dimension Measuring Devices Code as follows**:**

T.3. Tolerance Values. – **The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration**. The maintenance and acceptance tolerance values shall be ~~±~~ 1 division.

[Note the ±is stricken near the end of the second sentence.]

Background/Discussion: See Appendix A, Page S&T-90.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3509 ELECTRONIC LIVESTOCK, MEAT, AND POULTRY EVALUATION SYSTEMS

3509-1 W T.1. Tolerances on Individual Measurements (See related items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2 and 3600-4)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language in this code that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Electronic Livestock, Meat, and Poultry Evaluation Systems Code as follows**:**

> **T.1. Tolerances on Individual Measurements.** – The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration. Maintenance and acceptance tolerance s on an individual measurement shall be as shown in Table T.1. Tolerances.

Background/Discussion: See Appendix A, Page S&T-A92.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600 OTHER ITEMS

3600-1 D Electric Watthour Meters Code under Development

Source:
NIST OWM (2016)

Purpose:

1) Make the weights and measures community aware of work being done within the U.S. National Work Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for electric watthour meters used in submeter applications in residences and businesses;
2) Encourage participation in this work by interested regulatory officials, manufacturers, and users of electric submeters.
3) Allow an opportunity for the USNWG to provide regular updates to the S&T Committee and the weights and measures community on the progress of this work;
4) Allow the USWNG to vet specific proposals as input is needed.

Item under Consideration:

Create a "Developing Item" for inclusion on the NCWM S&T Committee Agenda where progress of the USNWG can be reported as it develops legal metrology requirements for electric watthour meters and continues work to develop test procedures and test equipment standards. The following narrative is proposed for this item:

In 2012, NIST OWM formed the U.S. National Working Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for commercial electricity-measuring devices (including those used in sub-metering electricity at residential and business locations and those used to measure and sell electricity dispensed as a vehicle fuel) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).

In 2013, the NCWM adopted changes recommended by the USNWG to the NIST Handbook 130 requirements for the Method of Sale of Commodities to specify the method of sale for electric vehicle refueling. At the 2015 NCWM Annual Meeting, the NCWM adopted NIST Handbook 44 Section 3.40 Electric Vehicle Refueling Systems developed by the USNWG.

This Developing Item is included on the Committee's agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) to keep the weights and measures community apprised of USNWG current projects, including the following:

- The USNWG continues to develop recommended test procedures for inclusion in a new EPO 30 for Electric Vehicle Refueling Equipment along with proposed requirements for field test standards.

- The USWNG is continuing work to develop a proposed code for electricity-measuring devices used in sub-metering electricity at residential and business locations. This does not include metering systems under the jurisdiction of public utilities. The USNWG hopes to have a draft code for consideration by the community in the 2016-2107 NCWM cycle.

The USNWG will provide regular updates on the progress of this work and welcomes input from the community.

For additional information, contact USNWG Chairman Tina Butcher at tbutcher@nist.gov or 301-975-2196 or Technical Advisor, Juana Williams at Juana.williams@nist.gov or 301-975-3989

Background/Discussion: See Appendix A, Page S&T-A93.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600-2 D Appendix A – Fundamental Considerations: Section 4.4. General Considerations (See related items 3100-1 and 3200-5)

Source:
Ross Andersen, Retired (2017)

Purpose:
Address the application of the code requirements across multiple devices.

Item under Consideration:
Amend NIST Handbook 44, Appendix A – Fundamental Considerations as follows:

4.**4. General Considerations.** –

The simpler the commercial device, the fewer are the specification requirements affecting it, and the more easily and quickly can adequate inspection be made. As mechanical complexity increases, however, inspection becomes increasingly important and more time consuming, because the opportunities for the existence of faulty conditions are multiplied. It is on the relatively complex device, too, that the official must be on the alert to discover any modification that may have been made by an operator that might adversely affect the proper functioning of the device. **Code requirements in the Handbook are applied only to a single device or system, unless specifically stated in the code. An electronic sum of measured values from multiple devices is not subject to code requirements, except that it be mathematically correct, i.e. add up to the proper sum - See General Code G-S.5.2.2.(e).**

It is essential for the officials to familiarize themselves with the design and operating characteristics of the devices that he inspects and tests. Such knowledge can be obtained from the catalogs and advertising literature of device manufacturers, from trained service persons and plant engineers, from observation of the operations performed by service persons when reconditioning equipment in the field, and from a study of the devices themselves.

Inspection should include any auxiliary equipment and general conditions external to the device that may affect its performance characteristics. In order to prolong the life of the equipment and forestall rejection, inspection should also include observation of the general maintenance of the device and of the proper functioning of all required elements. The official should look for worn or weakened mechanical parts, leaks in volumetric equipment, or elements in need of cleaning.

Background/Discussion: See Appendix A, Page S&T-A96.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600-3 W Appendix D – Definitions: Batching System

Source:
Richard Suiter Consulting (2016)

Purpose:
Add a definition to NIST Handbook 44 Appendix D to differentiate batching systems from other types of weighing and measuring systems.

Item under Consideration:
Amend NIST Handbook 44 Appendix D, Definitions as follows:

> **batching system. – One in which materials are measured in pre-determined quantities by weight and/or liquid measure. 2.20**

Background/Discussion: See Appendix A, Page S&T-A103.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600-4 W Appendix D – Definitions: overregistration and underregistration (See related items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2 and 3509-1)

Source:
Ross Andersen, Retired (2017)

Purpose:
Provide language that is consistent with the General Code.

Item under Consideration:
Amend NIST Handbook 44 Appendix D as follows**:**

> **overregistration and underregistration.–** When an instrument or device is of such a character that it indicates or records values as a result of its operation, its error is said to be in the direction of overregistration or underregistration, depending upon whether the indications are, respectively, greater or less than they should be. Examples of devices having errors of "overregistration" are: a fabric-measuring device that indicates more than the **verified** ~~**true**~~ length of material passed through it; and a liquid-measuring device that indicates more than the **verified** ~~**true**~~ amount of the liquid delivered by the device. Examples of devices having errors of "underregistration" are: a meter that indicates less than the **verified** ~~**true**~~ amount of product that it delivers; and a weighing scale that indicates or records less than the **verified** ~~**true**~~ weight of the applied load. [1.10]

Background/Discussion: See Appendix A, Page S&T-A105.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600-5 D Appendix D – Definitions: Remote Configuration Capability

Source:
NIST office of Weights and Measures (2013)

Purpose:
Expand the scope of definition to cover instances where the "other device," as noted in the current definition, may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:
Modify the General Code by adding the following paragraph to address security for systems adjusted using removable media:

> **G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using an event logger in the device. The event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)**
>
> **(Added 20XX)**

Exempt current sealing requirements from applying to devices and systems adjusted using a removable digital storage device by proposing changes to the sealing requirements in the following HB 44 code sections: 2.20., 2.21., 2.22., 2.24., 3.30., 3.31., 3.32., 3.33., 3.34., 3.35., 3.36., 3.37., 3.38., 3.39, 3.40., 5.55., 5.56.(a), and 5.58. This exemption is needed because the General Code paragraph being proposed will address the sealing of all device types and systems that can be adjusted using a removable digital storage device.

The following is an example of proposed changes to the Scales Code, which are intended to provide the exemption noted:

2.20. Scales Code

S.1.11. Provision for Sealing.

S.1.11.1 Devices and Systems Adjusted Using a Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2.

S.1.11.2 All Other Devices.- ***Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:***

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.
[Nonretroactive as of January 1, 1979]

(b) A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]

(c) Audit trails shall use the format set forth in Table S.1.11.
[Nonretroactive as of January 1, 1995]

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
(Amended 1989, 1991, 1993**,** and **20XX**)

Similar changes are also proposed to the current sealing requirements in each of the other device codes listed above. These proposed changes are available for review on NCWM's website, where the entire proposal has been posted.

Background/Discussion: See Appendix A, Page S&T-A107.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

3600-6 V 5.XX. Transportation Network Measurement Systems – Tentative Code and Appendix D Definitions (See related item 3504-1)

Source:
USNWG on Taximeters (2017)

Purpose:
Add a new tentative code for transportation-for-hire measurement systems being referred to as "Transportation Network Measurement Systems" to NIST Handbook 44.

Item Under Consideration:
Amend NIST Handbook 44 by adding a new code and definitions to Appendix D as follows:

5.XX. Transportation Network Measurement Systems – Tentative Code

This tentative code has only a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

(Tentative Code Added 20XX)

A. Application

A.1. General. – This code applies to a transportation network measurement system used in connection with a digital network that determines the actual time elapsed and/or distance travelled during a network-arranged ride to calculate a fare for transportation services.

Note: The fare is calculated by software services residing on the transportation network company servers using data transmitted by the indicating elements present in the vehicle, which are running software applications or services supplied by the transportation network company. The measurement data is generated from sources not physically connected to the vehicle, e.g., a navigation satellite system such as GPS and/or other location services.

A.2. Exceptions. – This code does not apply to:

(a) any system that charges a flat rate or fixed charge, and/or does not use a measurement of actual time elapsed or distance travelled to calculate a fare for transportation services;

(b) odometers on vehicles that are rented or hired on a distance basis (for which see Section 5.53. Odometers);

(c) taximeters (for which see Section 5.54. Taximeters); or

(d) any system where the fare is calculated by equipment located in the vehicle.

A.3. Additional Code Requirements. – In addition to the requirements of this code, transportation network measurement systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements. - Indicating and recording elements shall provide indications and recorded representations that are clear, definite, accurate, and easily read under any conditions of normal operation of the device(s).

All indicating and recording elements used in a transportation network measurement system shall operate correctly while using the online-enabled technology application service provided by the transportation network company.

S.1.1. General Indicating Elements. – A transportation network measurement system shall include, as a minimum:

(a) an indicating element used by a transportation network company driver that displays information and facilitates the measurements during a network-arranged ride to calculate a fare for transportation services; and

(b) an indicating element used by a transportation network company rider that displays information that allows the rider to review the current rate(s) for the transportation service and request a ride.

S.1.2. General Recording Elements. – A transportation network measurement system shall be capable of:

(a) recording all information necessary to generate a receipt specified in S.1.10. Receipt; and

(b) providing information to transportation network company drivers, including but not limited to a summary of rides given as specified in S.1.11. Driver's Summary; and

(c) providing a copy of all metrological data required by law to be provided to a weights and measures jurisdiction with statutory authority.

S.1.3. Identification. – All transportation network measurement system indicating elements shall display for the purposes of identification the following information:

(a) the name, initials, or trademark of the transportation network measurement system manufacturer, distributor, or developer; and

(b) the current version or revision identifier of the software application service provided by the transportation network company running on the indicating elements identified in S.1.1. General Indicating Elements.

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

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

S.1.4. Location of Identification Information. – The information required by S.1.3. Identification shall be accessible through an easily recognized menu and, if necessary, a submenu or other appropriate means. Examples of menu and submenu identification include, but are not limited to, "Help," "About," "System Identification," "Weights and Measures Identification," or "Identification."

S.1.5. Display of Rates and Additional Charges. – The transportation network measurement system shall be designed to make available to transportation network company riders the rate(s) for transportation services before the beginning of a network-arranged ride. The system shall also be capable of providing an explanation of the basis for calculating a fare including, if applicable, the base fare, rates for time and distance, and the amount of a booking fee, platform fee, or other similar service fee, before a rider submits the request for a network-arranged ride.

S.1.6. Fare Estimates. The transportation network measurement system shall be capable of displaying a fare estimate to the transportation network company rider before a request for a network-arranged ride is made.

S.1.7. Actuation of Measurement System. – Following the initiation of a network-arranged ride by the transportation network company driver, and prior to the conclusion of that network-arranged ride, the transportation network measurement system shall only indicate and/or record measurements resulting from the movement of the vehicle or by the time mechanism.

S.1.8. Fare Adjustment. – A transportation network measurement system shall be designed with:

(a) a "time off" mechanism and a "distance off" mechanism provided for the transportation network system driver to render the measurement of time and distance either operative or inoperative during the ride; or

(b) the capability to make post-transaction fare adjustments to reduce the amount of the fare, provided that the system creates a record of all location and time data from the time the ride request was accepted by the transportation network company driver.

[Nonretroactive as of January 1, 20XX]

S.1.9. Fare Identification and Other Charges.

S.1.9.1. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression when displayed on the transportation network company system receipt required by S.1.10. Values shall be defined by suitable words or monetary signs.

S.1.9.2. Other Charges. – Other charges shall be indicated as separate line items when displayed on the receipt required by S.1.10. Receipt. Other charges shall be identified using an appropriate descriptive term, including but not limited to "Booking Fee," "Tolls," "Airport Pickup/Dropoff Surcharge" or an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.10. Receipt. – A transportation network measurement system shall issue a printed or electronic receipt to a transportation network company rider. This receipt shall include as a minimum the following:

(a) date of the start of the trip;

(b) unique identifying information sufficient for the transportation network company to identify the transaction, or other identifying information as specified by the statutory authority;

(c) start and end time of trip, total time of trip (maximum increment of one second), and if applicable, the total elapsed time during any time-off period;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the associated fare in $;

(f) other charges where permitted shall be identified and itemized;

(g) total charge in $;

(h) the start and end addresses or locations of the trip;

(i) a map showing the route taken; and

(j) a means to obtain transportation network company rider assistance.

S.1.11. Driver's Summary. – A transportation network measurement system shall be capable of providing a summary of the driver's activity regarding network-arranged rides. The summary shall include, but not be limited to, the following information about each ride:

(a) date and time for start of trip;

(b) unique identifying information sufficient for the transportation network company to identify the transaction, or other identifying information as specified by the statutory authority;

(c) total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the total fare received;

(f) other charges where permitted; and

(g) a means to obtain transportation network company driver assistance.

S.2. Provision for Sealing.

S.2.1. System Security. – Adequate provision shall be made to provide security for a transportation network measurement system. The system shall be designed to:

(a) protect the integrity of metrological data and algorithms used to compute fares from such data against unauthorized modification using industry-standard technological protection mechanisms such as data encryption; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data and algorithms used to compute fares from such data only to authorized persons.

S.2.2. System Audit. – The transportation network measurement system shall be designed in a manner that permits officials having statutory authority to verify compliance with this transportation network measurement system code.

S.2.3. Change Tracking. – Changes made by the manufacturer, distributor, or developer of a transportation network measurement system to any algorithms or code which have a metrological effect shall be logged and recorded. The period covered by this change record is not required to exceed one year.

S.3. Provision for Trip Data Loss. – In the event that a portion of the trip data is lost due to power or signal interruption by the transportation network company driver's indicating element, the transportation network measurement system shall be capable of determining the information needed to complete any transaction in progress at the time of the power or signal loss.

S.3.1. Intermittent Trip Data Loss. – When the location services signal is lost intermittently during a prearranged ride (e.g., traveling through a tunnel) but recovered prior to the end of the ride, the transportation network measurement system shall be capable of calculating an accurate fare in accordance with T.1. Tolerance Values.

S.3.2. Significant Trip Data Loss. – When the location services signal is lost for a significant portion of the network-arranged ride, the transportation network measurement system shall provide for alternative fare structures.

Note: Significant trip data loss refers to instances when the location services signal is lost to the extent that the transportation network measurement system is not capable of calculating an accurate fare in accordance with T.1. Tolerance Values using actual time and actual distance, or when the signal is not regained by the end of the ride.

S.3.3. Alternative Fare Structures. – In the event the transportation network measuring system is not using actual time and actual distance for a particular trip (e.g., zone-based fares, signal loss), that portion of the fare not based on actual time and actual distance is not subject to this code. Charges not based on actual time and actual distance measurements may be based on the terms of service.

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, distance test(s) of a transportation network measurement system shall be conducted. The distance test(s) shall consist of a road test unless safety or other practical concerns prohibit road testing. A transfer standard test may be performed in the absence of a road test. At least one test shall be of a length sufficient to exceed the minimum fare.

N.1.1.1. Road Test. – The test consists of operating the conveyance over a precisely measured course calibrated to a traceable linear measure of at least one mile in length

N.1.1.2. Transfer Standard Test. – The test consists of operating the conveyance over an unmeasured course while using a calibrated transfer standard, such as a fifth-wheel, to measure the distance travelled.

Note: Field examinations of transportation network measurement systems need not include testing of all individual devices that are used as driver/passenger indicating elements in connection with the service provided. It is considered sufficient that a representative sample of various indicating elements be incorporated in testing to verify proper operation of the system.

N.1.2. Test Procedures.

N.1.2.1. Test Length. – All tests must be at least one mile in length. If a measured course or testing equipment is not readily available that will enable a test of a length sufficient to exceed the minimum fare, after completing the testing specified in N.1.1. Test Methods, an additional unmeasured test may be conducted. The purpose of this additional unmeasured test is to verify compliance with S.1.10. Receipt.

N.1.2.2. Additional Tests. – If during testing a transportation network measurement system produces a measurement that does not comply with the tolerance values in T.1.1. Distance Tests, a minimum of three additional tests shall be conducted at the same location where all test variables are reduced to the greatest extent practicable to verify the system's ability to repeat transaction indications. Repeatability testing performed in excess of these three additional tests is done at the discretion of the official with statutory authority.

To verify system-wide noncompliance, tests for variability shall be conducted, including a minimum of three consecutive tests of varying lengths, locations, and/or environmental conditions.

N.1.3. Test Conditions.

N.1.3.1. General. – Except during type evaluation, all tests shall be performed under the conditions that are considered usual and customary within the location(s) where the system is normally operated as deemed necessary by the statutory authority.

N.1.3.2. Roads. – All tests shall be conducted on public roads which are in good repair.

N.1.3.3. Testing for Environmental Influences. – During type evaluation, the distance test may include a route traveled by the vehicle that will expose the system to conditions that could contribute to the loss of, or interference with the location service's signal. This may include:

a) **Objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;**

b) **Routes that do not follow a straight-line path;**

c) **Significant changes in altitude;**

d) **Any other relevant environmental conditions**

N.2. Time Test. – A transportation network measurement system which determines time elapsed shall be tested for compliance with the tolerances values specified in T.1.2. Time Tests, using a certified, traceable standard.

T. Tolerances

T.1. Tolerance Values. – The tolerances will be as specified in T.1.1. Distance Tests and T.1.2. Time Tests. (The following proposed tolerance values will be confirmed based on performance data evaluated by the U.S.

National Work Group before the transportation network measurement systems code becomes a Permanent Code).

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 2.5%

(b) On Underregistration: 2.5%

T.1.2. Time Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 5 seconds or 0.5%, whichever is greater

(b) On Underregistration: 5 seconds or 0.5%, whichever is greater

T.2. Tests Using Transfer Standards. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

UR. User Requirements

UR.1. System Indications. – The indicating elements identified in S.1.1. General Indicating Elements shall display indications and information in a manner such that they can be conveniently read by the user of the device, computer, website, or online-enabled technology application service.

UR.1.1. Statement of Rates. – The transportation network company rider shall be able to view the basis for calculating the fare including, if applicable, the base fare, rates for time and distance, and the amount of a booking fee, platform fee, or other similar service fee.

UR.2. Change Tracking. – Upon request by an official having statutory authority, the transportation network company shall provide an explanation of changes that are logged pursuant to S.2.3. Change Tracking requirement during the time period covered by the request. Any such request shall be answered within two business days, unless extended by the official having statutory authority. Records provided pursuant to S.2.3. Change Tracking shall be treated as confidential and proprietary to the extent permitted by any applicable law.

UR.3. System Installation and Operation. – The transportation network company driver shall use the indicating elements identified in S.1.1. (a) General Indicating Elements in accordance with the requirements of the manufacturer, distributor, or developer.

UR.4. Fare Estimates. – Estimates for fare charges shall be provided by the transportation network measurement system when requested by the transportation network company rider and following the input of a final destination for the trip being requested. The recipient of the fare estimate shall be able to access information about the fare estimate, including key variables that may lead to discrepancies between actual fare charged and the fare estimate provided as required by law.

UR.5. Determination of Total Charges When Location Service Data is Lost. – The transportation network company shall disclose the manner in which total charges are determined when there is significant data loss from location services to the transportation network company rider and driver after the conclusion of the trip.

Appendix D

digital network. – An online-enabled technology application service, website, or system offered or used by a transportation network company that enables a transportation network company rider to arrange a network-arranged ride with a transportation network company driver. [5.XX]

network-arranged ride. – The provision of transportation by a transportation network company driver to a transportation network company rider, or other persons selected by the transportation network company rider, arranged through a digital network. [5.XX]

transportation network measurement system. – The information technology infrastructure and services offered or used by a transportation network company that receives data collected through a digital network and calculates a fare for a network-arranged ride.

transportation network company. – An entity that uses a digital network to connect transportation network company riders with transportation network company drivers who provide network-arranged rides, and offers or provides a transportation network measurement system, subject to an agreement or terms of service between the transportation network company and transportation network company rider or driver. [5.XX]

transportation network company driver. – An individual authorized by the transportation network company to access the digital network and receive connections to transportation network company riders for the purpose of providing network-arranged rides. [5.XX]

transportation network company rider. – An individual who has obtained an account with a transportation network company and uses the transportation network company's digital network to connect with a transportation network company driver who can offer or provide a network-arranged ride to the transportation network company rider or other persons selected by the transportation network company rider. [5.XX]

transfer standard. – A device or standard used in the field to evaluate the device or system under test.

Background/Discussion: See Appendix A, Page S&T-A109.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents.

Dr. Matthew Curran, Florida | Committee Chair
Ms. Jane Zulkiewicz, Town of Barnstable, MA | Member
Mr. Ivan Hankins, Iowa | Member
Ms. Rachelle Miller, Wisconsin | Member
Mr. Josh Nelson, Oregon | Member
Mr. Luciano Burtini, Measurement Canada | Canadian Technical Advisor
Mr. Rick Harshman, NIST, OWM | NIST Technical Advisor
Mr. Darrell Flocken, NCWM | NTEP Technical Advisor

Specifications and Tolerances Committee

Appendix A

Background/Discussion on Agenda Items of the Specifications and Tolerances (S&T) Committee

Subject Series List

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing System	NEWMA	Northeastern Weights and Measures Association
AAR	Association of American Railroads	NIST	National Institute of Standards and Technology
API	American Petroleum Institute	NTEP	National Type Evaluation Program
CNG	Compressed Natural Gas	OIML	International Organization of Legal Metrology
CWMA	Central Weights and Measures Association	OWM	Office of Weights and Measures
EPO	Examination Procedure Outline	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GMM	Grain Moisture Meter	SD	Secure Digital
GPS	Global Positioning System	SI	International System of Units
HB	Handbook	SMA	Scale Manufactures Association
LMD	Liquid Measuring Devices	SWMA	Southern Weights and Measures Association
LNG	Liquefied Natural Gas	TC	Technical Committee
LPG	Liquefied Petroleum Gas	USNWG	U.S. National Work Group
MMA	Meter Manufacturers Association	VTM	Vehicle Tank Meter
MDMD	Multiple Dimension Measuring Device	WIM	Weigh-in-Motion
NCWM	National Conference on Weights and Measures	WWMA	Western Weights and Measures Association

Details of All Items
(In order by Reference Key)

3100 – GENERAL CODE

3100-1 D G-S.5.2.2. Digital Indication and Representation (See related items 3200-5 and 3600-2)

Background/Discussion:
The submitter provided the following comments:

Some are now coming to understand that the NCWM made a mistake in 1990 in interpreting how we apply the code requirements to the three-platform, three-indicator truck scale with a fourth summed indication. In any suggestion that a Code should be changed or reinterpreted, there is an unstated requirement that there must be some conflict that needs resolution. Often the difficult part is in just identifying the conflict or in finding the right question to expose the conflict to others and, in doing so, possibly point to the resolution. Some might think there is no conflict and there is no issue, but I must disagree.

What stands out on this issue to me is the huge divide between the public sector and private sector on this issue. It was black and white in 1989, good guys vs the bad guys. The public sector, me included, saw the issue one way while the scale industry almost unilaterally saw it differently. As I think back over my career, I find it hard to find many issues where consensus between the two sides eluded the NCWM as it did for this issue. In my experience, the scale industry works toward consensus as earnestly as the public sector. If there is no consensus here, this should bother us all and encourage us to try to understand why.

If we ask the question on our current issue, as Henry Oppermann has, it goes like this: How do we apply the Scales Code requirements to a three-platform scale with three independent weight indications and a fourth indication of the sum of the three independent platforms? His answer follows his logic of the "duck test." Quoting him, "if a scale looks like truck scale, operates like a truck scale, and weights trucks, then it is a truck scale."

It is important to note that a parallel issue was on the 2016 S&T agenda dealing with the v(min) requirement for these three-platform scales with three independent indicators. However, in dealing with this small part of the larger issue, the Committee has chosen to ignored the larger issue for now. In my testimony at the 2016 interim meetings, I pointed out that the v(min) change would result in a mixed state of being. Part of our interpretation would treat the three scales as three i.e. for v(min), but treat them as one for all other requirements. Does this make sense?

I see an immediate problem here, as Henry's quote is based on thinking from 1989, and I'll suggest much earlier, pre-1986 to be exact. We can see this in Tables 7b. and 7a. in the Scales Code. These tables deal with selection requirements for unmarked scales and marked scales. Table 7b. reflects that pre-1986 thought process where the application of the unmarked device determined what technical and performance requirements would apply. This is the model implied in Henry's comment and in the thought process we see from the S&T Committee as it wrestled with this issue in 1990. Quoting from page 157 of the 1990 S&T final Report: "The classification of a scale or weighing system into an accuracy class should be based upon its application and method of use, not on the design of the device." In the same paragraph the report also notes, "The significance of this interpretation is that not only must each independent weighing device meet the requirements of Handbook 44, but the entire

weighing system must meet all requirements that would apply if the device were a single scale." (emphasis added) This was voted on and approved by the public sector voters of the NCWM with strong (non-voting) opposition from the scale industry.

Looking at that last statement in the S&T report today, does it even make sense? Table 7a. made a radical departure from the pre-1986 way of thinking. Under the "New" Scales Code which took effect January 1, 1986, the technical and performance requirements were determined by the class designation that was chosen and marked on the device by the manufacturer. In the wording of the table, it is a typical application of the class. Thus the requirements apply based on the class designation as marked by the manufacturer and the device is adapted to the application. To me this contradicts the S&T conclusions in 1990.

I'm suggesting that a "duck test" is not valid for marked devices. For example, there is no single set of requirements for a marked truck scale. By this I mean one can use a class III or a class IIIL scale to weigh trucks and the requirements are therefore very different. This was impossible to imagine prior to 1986 under the "Old" Scales Code. It is the manufacturer, in the design and production phases, who determines and marks the class. It is the marked class that determines which technical requirements will be applied to the device, and this is done before it leaves the plant. The code recognizes that the manufacturer has no means to limit the application once the purchaser buys the device. Whether a device is suitable is a separate question and has a separate requirement, i.e. G-UR.1.

I believe the "duck test" is not valid for the entire Handbook. For me the critical issue we have to address is how to apply code requirements in general. The simple direct answer is; we apply code requirements to a device. That is how the requirements are written, in the singular. Why is this singularity important? The answer lies in unstated general principles in Handbook 44 which we can elicit by asking, "How do we measure quantities of things in commerce, generally?" By generally, I mean across all codes. My answer is that the codes clearly allow multiple solutions to that question. I'll state this more specifically:

A commodity exchanged in commerce may be measured:

A. as a single draft measured using a single measuring instrument.
B. as the sum of measurements of sub-parts of the whole using multiple drafts on a single measuring instrument.
C. as the sum of measurements of sub-parts of the whole using multiple drafts of multiple measuring instruments.

It must be noted that the instrument used in any of the options A through C, must be suitable for service when measuring the whole or the sub-part in conformance with G-UR.1. For the purposes of this discussion we will stipulate that all measuring instruments involved are suitable for service, whether measuring the whole or the sub-part. For example, all weighments are stipulated to be greater than the recommended minimum load in Table 8 or liquid quantities in conformance with G-UR.1.3.

A couple of examples might help. I don't think I need to illustrate option A, as it is the most common solution. Option B can be seen with an Automatic Bulk Weighing system which operates by summing multiple drafts weighed on the same scale to provide a total weight of the whole commodity. But I could also do option B using VTM's. I could make multiple deliveries from a single VTM unit to fill a large customer order, i.e. larger than the tank capacity of the single VTM. Alternatively, I could fill that order using drafts from multiple VTM units, option C.

Our assumption in accepting each of these options is that the sum of measurements from multiple compliant instruments is de facto compliant. In fact, the reason that we use multiple drafts in the first place is that the total will probably exceed our ability to verify the quantity of the whole, even if we wanted to! Going back to our

examples, how could we verify, after the fact, that the 1,000 tons of grain loaded on a barge from an ABWS system with a 50,000 lb capacity scale is accurate? That's at least 40 drafts.

What becomes very clear to me in the general case is that the technical and performance requirements are applied to the individual device without regard to the summed total. It seems this summed total has always been the crux of the issue. Does this summed indication now link the three independent platforms with their independent indication in a way that makes them one device for legal purposes? This is what the S&T Committee decided in 1990. Some would continue to say yes and some would say no. However, there is the law to consider. By law, I mean the general rules of construction of legal requirements. In construction we must not be arbitrary and capricious. I believe those that say the three scales are one scale are being arbitrary and capricious.

To see how this is so, consider what UR.3.3. Single-Draft Weighing means. Below is the current HB44 text.

UR.3.3. Single-Draft Vehicle Weighing. – A vehicle or a coupled-vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination. However, the weight of:

(a) a coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results; or

(b) a vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform.

The first sentence makes it clear that this is not a general provision as it limits the scope of the requirement to "a vehicle or a coupled-vehicle combination." It now goes on to say that any entity fitting one of those two descriptions shall be weighed as a single draft. Note that this is option A from the general case above. The paragraph goes on to provide more explanation of what single-draft means.

Then we come to a "However," indicating there are viable alternatives to the single-draft requirement. Alternative (a) allows the coupled combination to be divided into sub-parts that are weighed separately and the weight of the coupled combination is found by summing the individual weights of the sub-parts. Alternative (b) says that a vehicle or a coupled combination may be suspended simultaneously on more than one scale and the weight is found by summing the indications of the multiple scales.

On first glance we might think that alternative (a) is option B from the general case, and alternative (b) is option C. However, closer reading will show that is not the case. Look carefully at the wording of alternatives (a) and (b). You cannot equate (a) with option B since (a) does not limit you to a single scale. You might assume that the multiple parts would be weighed on the same scale, but the code does not stipulate that. To do that the code would have to add the words, "on the same scale," i.e. …. weighing each unit separately <u>on the same scale</u>, and adding together the results; " What I'm pointing out is that (a) as it is now written allows either general option B or C. By this I am considering the case where there are multiple scales available at the site. Each of those scales might have capacity 200,000 x 20 lb. For example, think about one of those three component trucks (tractor, trailer, and pup). Alternative (a) allows you to uncouple and weigh the three sub-parts on three scales, two scales, or one scale in full compliance with the code.

Now it becomes clear that UR.3.3. is addressing the real issue with weighing large vehicles and coupled-vehicle combinations, and that is shifting loads and coupler interactions. In alternative (a) you eliminate both interferences by isolating each part on its own scale. In alternative (b) by supporting the vehicle or combination on multiple scales, any shift in the load or coupler interaction cancels out. If load shift or couple interference reduce the weight on one platform it increases it on another. Of critical importance, the three-platform scale, that

is the focus of this discussion, is an application of (b) where the load is supported simultaneously on more than one platform and the individual indications of the three scales are summed to get a total. There is no other way to describe what is happening since the total indication is, in fact, a sum of the weights from the three separate platforms. Also of critical importance, there should be no expectation whatsoever that the sum valued obtained in alternative (a) will be identical to alternative (b).

However, getting back to the question about three scales or one, it should now be clear that the Handbook clearly allows summed indications from multiple devices using options B or C. If the S&T statement is correct, then the code requirements must be applied across two scales or three scales in the example of multiple scales at a site. Thus the three, one-hundred ton scales have a combined 30,000 divisions according to that interpretation. This would virtually preclude having multiple scales at the same site as they might be used to weight a single coupled-vehicle combination in pieces. Even going to 50 lb divisions still puts them out of compliance. Also, you have to consider the shift test requirements, which now require agreement of sections across all three scales!

Finally, we have to consider other cases of three independent scale platforms configured to weigh trucks. In case one, each platform has a stand-alone independent indicator and the three indications are manually summed by the operator. In case two, each platform has an individual indicator but all three indicators are housed in a single enclosure. Again the summing is done manually by the operator. In both of these cases the three independent instruments remain independent under the 1990 decision. This is what I mean by arbitrary and capricious.

Now suppose I can weigh a coupled-vehicle combination on three platforms with three separate indicators and manually add the indications to obtain a total weight for the combination. As I understand the 1990 decision, those three scales do not have to meet requirements like the number of scale divisions extended across all three scales. That extension only applies it there is a single weight display for the three scale indications and a fourth electronic indication for the sum. The results obtained are absolutely identical in function (adding manually on paper or having the system add them up) yet you are applying different requirements to the three scales depending on whether you are doing it manually or electronically. Isn't that being blatantly arbitrary and capricious?

Move over to the VTM example, and the three VTM units used to fill that order, must those three meters be treated as one meter, think about repeatability tests. It doesn't make sense for scales, nor does it make sense for any of the other codes. Thus I argue that options B and C allow the summing of multiple devices without forcing them to be considered one instrument for applying code requirements. I believe the HB needs to say that explicitly to avoid confusion.

I offer one additional item of support. I found reference that this issue has been raised internationally. Sections of the 2009 WELMEC guide to Non-Automatic Weighing Instruments addresses this issue quite clearly (see pertinent sections on the final pages of this document). Point 3.1.16. in the Guide addresses the same issues as UR.3.3. where multiple platforms are used. The applications coincide with those I expressed in this discussion paper. Also I believe point 3.1.54. addresses the use of multiple axle-load scales to weigh a vehicle. It also supports the conclusion that the individual axle-load scales do not become a single instrument for compliance purposes. In extension, if 3.1.54. does not apply MPE (tolerances) to the summed indication, it also does not extend other technical requirements such as v(min) [which the NCWM has addressed], n(max), shift test, etc.

The fundamental Considerations change is necessary to spell out clearly that code requirements do not extend across multiple devices unless specifically stated. A good example is the application of the code to wheel-load weighers designated as and used in pairs. For those scales designated as pairs, many authorities apply the tolerances only the combined indication of the pair. None of the other requirements applicable to the wheel-load weigher is affected by this exception. For example, the combined number of divisions for the pair is not limited to 1,200 as in Table 3. Other requirements like identification markings, rules for indicators, zero load adjustments, etc., remain applicable only to the individual wheel-load weigher and not to the pair.

The addition to G-S.5.2.2. is necessary since you can't write requirements into the Fundamental Considerations. That section is there to help understand how to apply what is written in the codes. You must have a specification that the electronic sum be mathematically correct to reference if there is non-compliance. That is: readings from three scales of 107, 206, and 98 must result in an electronic sum of 411.

Note 4 in Table 3 has to be changed, since the last two sentences address these instances of multiple independent scales and reflect the 1990 decision. The removal of the last sentence removes the summed indicator from consideration under the classification system as discussed above, since the summed indication is not a directly measured quantity and is not subject to class requirements. The summed indication is also not subject of requirements to n(max), tolerances, etc. When this last sentence is removed, it makes the next to last sentence unnecessary. Since each of the independent scales are already covered under the general provisions of the Table.

There is a small side issue regarding multiple devices using option C where the division size is not the same for all the devices. The general principle, i.e., that summing the indications from compliant devices is a valid way to measure a commodity, does not necessarily require that division sizes of the individual devices be identical. Note that you might want to apply UR.1.3. to printed records from the three scales. However, the new Fundamental Considerations paragraph exempts the summed indication since code requirements do not apply to the summed indication except the mathematical correctness. Also the summed indication is a sum not a representation of a scale division. It is just a sum of the values obtained from the individual compliant devices. The individual weights are also required to be shown on any record of the transaction. While the different division sizes may offend our sensibilities a little bit, on what objective basis can we say it violates the general principle, i.e. the sum of multiple compliant measurements is also de facto compliant. It is this compilation of original sources for the sum and the sum that provides the transparency for the transaction. Note the WELMEC reference indicates this is the position taken by many internationally.

I can think of another possible situation in the case of multiple ABWS systems. Suppose you are loading to a single barge from two sources where the two ABWS scales have different division sizes. The scale controller interfaced to the two scales now can print each of the weighments from each of the two scales and a single total for the entire transaction. The sum need only be mathematically correct since it is a mathematical sum of independent, compliant weighments.

From May 2009 version of WELMEC Directive 90/384/EEC: Common Application Non-Automatic Weighing Instruments (available at www.welmec.org/latest/guides/)

3.1.2 Calculated weight (Meeting 10, Decision 10)

Where the indication represents an actual determination of the weight then the indication must respect the error allowance and be presented in the correct format.

When gross, net and tare are printed together, weight may be calculated from two actual determinations of weight. In the case of a multi-interval instrument it would be allowed to print a calculated value with the least significant digit which need not be rounded to the relevant scale interval.

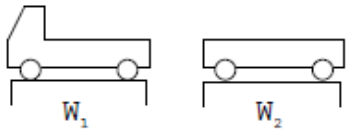
Any printout of the calculated weight values should be identified as calculated weight values.

(See also Sections 3.1.16 and 3.1.54)

3.1.16 Combined and multi-plate weighbridges (Meeting 14, Point 4, Meeting 15, Point 2 and Meeting 18, Point 9)

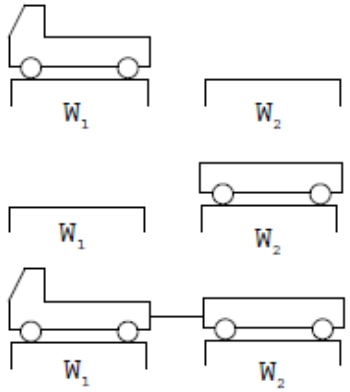
This concerns weight obtained by using adjacent weighbridges. Acceptable solutions, with examples, are shown below:

Two weighbridges, each with its own indicator:



W_1 = 30 t x 10 kg
W_2 = 30 t x 10 kg
(Two indicators; simultaneous indication necessary)
Calculated weight 60 t x 10 kg
(mpe does not apply to calculated weight)

Multi-plate weighbridge with one indicator:



W_1 = 30 t x 10 kg

W_2 = 30 t x 10 kg

W_{1+2} = 60 t x 20 kg

W_{1+2} is a weighing range (Compatibility of modules and mpe must be satisfied for it)

(See also Sections 3.1.2 and 3.1.54)

3.1.54 Vehicle weighing by summation of individual wheel load NAWIs ("axle weighers") (Meeting 25, Point 9)

If the total weight of a vehicle is calculated automatically by summing the individual weight values produced by individual wheel load NAWIs ("axle weighers"), the system is not to be regarded as being one single NAWI. The mpe does not apply to calculated weight.

(See also Sections 3.1.2 and 3.1.6)

3.1.6 Load cells

(Note that throughout this guide, "load cells" refers to analogue load cells rather than digital load cells unless stated otherwise.)

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3100-1, 3200-5, and 3600-2 together and took comments on these items simultaneously because it considered them related.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes these items as it believes they restrict the use of multiple scales operating using internal resolution to create an additional scale that provides the total weight.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) submitted written comments in opposition of the items stating "I am opposed to these items and the items should be withdrawn. The proposed changes go against the principles of Handbook 44, the principles of OIML R76, and violate the WELMEC guideline. The adoption of accuracy classes for scales established relationships among accuracy classes, scales within accuracy classes, the number of scale divisions in scales, and the sizes of scale divisions. The adoption of accuracy classes DID NOT CHANGE the suitability of equipment criteria used to determine which scales are acceptable for use in specific applications."

Mr. Ross Andersen (NY-Retired) stated he submitted these items to address what he considers to be a "multiple scale array." He said that he had voted in support of the 1990 S&T Committee's interpretation of how HB 44 requirements are to apply to these systems, but now questions that decision. He indicated that the code doesn't dictate to test the scale the way it's used, but that's what regulators do. He also indicated that HB 44 tolerances are not intended to apply to summed indications and questioned how it could be that the v_{min} formula only apply to the independent scales of a system and all other HB 44 requirements apply not only to the independent scales, but also to the system as a whole. He asked, "How can we tell a manufacturer to tell us what the scale is, but we then change that in the field?" Mr. Andersen noted that the fourth indicator only provides a summed indication of the individual scales in the system and is not to be considered a fourth scale because it is the combined total and is acceptable under the code. Mr. Andersen made note of the following to support his position on this issue:

1. Nowhere in HB 44 code does it specify that a summed indication must comply with HB 44 tolerances.
2. Scales Code paragraph UR.3.3 Single-Draft Vehicle Weighing allows for the summing of indications to weigh a vehicle when different portions of the vehicle are resting simultaneously on more than one scale.
3. The Fundamental Considerations section is to clarify for "all times" that a device is a singular device.

Mr. Andersen acknowledged that his proposals are not ready for voting this year, but need discussion.

Mr. Rick Harshman, (OWM) provided the following comments and recommendations on behalf of OWM:

- The changes proposed by this group of items, if adopted, would have the effect of loosening the current tolerances applicable to those vehicle scales that are equipped with multiple independent weighing/load-receiving elements, each with its own digital weight display and an additional display that provides an electronic summed indication of all. It is possible because of how the tolerance bands in HB 44 Table 6 are structured and due to the effect of digital rounding of the different indications provided by such a system, that each independent scale within the system could be within applicable tolerance, yet the summed total may not. Mr. Harshman noted that OWM had provided an example in its analysis of this item to the Committee that shows this to be true. Thus, if you are willing to buy into the concept that HB 44 requirements should not apply to summed indications, then you must also be willing to accept some additional allowable error in the results obtained from these systems. OWM doesn't think this is necessary nor does it believe that the submitter has provided any technical justification for doing so. OWM's expectation of any commercial vehicle scale, regardless of how it is configured, is that it performs to within the current tolerances specified in HB 44.

- In commercial applications where these systems are used, it is the summed indication that serves as the basis for commercial transaction. Not only do truckers rely on the weights obtained from these systems to verify compliance of their loads with legal load limits for individual axles, tandem axles, and gross vehicle weight, but oftentimes so do small local businesses needing to determine the weight of vehicles for commercial purposes. The various truck stops providing these scale systems normally charge a fee for the weight determination, which includes a printed receipt of the load applied to each individual weighing/load-receiving element and the summed result. The expectation of those receiving this service is that each weight, including the summed indication, be accurate to the tolerances specified in HB 44.

Additionally, many of the truck stops throughout the country offering this weighing service post signs visible from the roadway indicating "Certified Scale." OWM considers a "certified scale" to be one that provides indications and recorded representations that are certifiable. OWM's interpretation of a certifiable weight is one that meets or exceeds the applicable tolerance specified in HB 44. Failure to apply code requirements to the summed indications of these systems would, in OWM's view, cause such advertising to be deceptive. That is, it could no longer be claimed, nor would it be necessary for officials to verify, that a load applied to the scale when positioned on more than one independent weighing/load-receiving element is accurate to within applicable tolerance specified in HB 44 for that load. OWM notes too, that many of these systems are used by truck weight enforcement agencies and the weights obtained are used to determine fines for exceeding legal load limits. The expectation of their accuracy is the same regardless of the application; each individual scale must be accurate and the summed total must also be accurate to within the tolerances specified in HB 44.

- In conclusion, OWM believes the interpretation provided by the 1990 S&T Committee was reasonable, accurate, and is still appropriate today. It would be unfair to apply a different performance standard to one vehicle scale over another when the application of those scales is the same. The requirements as described have been applied to these systems for more than 25 years (i.e., since the date the Committee's interpretation took effect) and scale manufactures and service agencies have been installing these systems into commercial and law enforcement applications with no apparent issues concerning their accuracy when applying tolerances based on the 1990 Committee's interpretation. The total vehicle weight determined from these weighing systems is being represented as a weight that complies with HB 44.

Ms. Julie Quinn (MN) stated that this addresses uniformity and further noted that some states are already doing what is contained in the proposal whereas other states are not.

In considering this group of items, the Committee agreed to assign them a "Developing" status to allow the submitter additional opportunity to address the comments and concerns of OWM and others.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA only heard comments from the NIST/OWM. There was a concern that this would increase the tolerance applied to this type of device and may also cause conflicting tolerances. The WWMA heard items 3100-1 and 3600-2 together. The WWMA forwarded this item to NCWM, recommending Developing status.

The CWMA commented that, while the appendix related to this item was very informative, due to the volume of information, the CWMA was unable to determine what situation this item was addressing. They would welcome a concise explanation regarding this item. CWMA forwarded the item to NCWM, recommending Developing status.

The SWMA batched items 3100-1, 3200-5 and 3600-2 together and heard comments for all at the same time. Mr. Henry Oppermann (Weights and Measures Consulting) disagrees with these items and opposes them. He recommends withdrawing all three items in this batch. Mr. Oppermann contends they violate the principles of Handbook 44. He further contends this should be on performance and not design. Mr. Oppermann concluded by stating the submitter misinterpreted the WELMEC guidelines and multiplatform truck scales used together have to function as a single scale. The Committee did not forward these items to NCWM and recommends they be Withdrawn because the proposed language is unnecessary.

NEWMA believes this item has merit; however, the Committee would like an example of how this applies to independent/multiple devices. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3100-2 W G-UR.3.3. Position of Equipment

Background/Discussion:
Over the years due to the verbiage of the current G-UR 3.3. regulation there has been a variety of different interpretations of what devices require outside indicating elements (e.g. scoreboards / remote indicators) and which do not. Some businesses believe that if they allow their customer to get out of their vehicles to come into the office/scale house that satisfies the regulation. Where as many inspectors, service people and customers believe that any device that requires indications to be accurately read from where the load-receiving element is located, needs to have such outside indicating elements installed.

With the terms more defined remote indicators / scoreboards would be required to be installed on most vehicle scales which would not only help the inspectors but would be a convenience for the service companies and in the long run save the businesses money due to the amount of time it takes to walk from the weigh load-receiving element to the indicating element. Safety is another important reason. Fewer drivers leaving their vehicle to verify indications would result in fewer accidents.

The cost of installing remote indicators / scoreboards is primarily the only reason against.

2017 NCWM Interim Meeting
During open hearings at the 2017 NCWM Interim Meeting, the Committee received numerous comments from industry, NIST, and regulatory officials alike expressing concern and opposition to this item to include:

- The proposal does not provide clarification to existing requirements for visibility;
- It was noted the proposed changes are retroactive and it was questioned how compliance could be met for existing mechanical-type scales, such as a vehicle scale with beam indication;
- The changes proposed fail to consider that some (particularly older) devices will be unable to comply without significant and potentially costly modifications;
- The use of examples in HB 44 is not recommended;
- The item could have overreaching impacts to existing installations for various device types.

The Committee did not receive any comments in support of the item. During its work session, members of the Committee reviewed existing paragraph G-UR.3.3. Position of Equipment and it was agreed that the current paragraph already provides officials the necessary discretion to decide on a case by case basis whether or not a particular device used in a direct sale complies with the provisions of this paragraph. For this reason, and in consideration of the comments received in opposition to the item during the open hearings, the Committee agreed to withdraw this item.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believed the proposed changes to G-UR.3.3. will have an effect on all devices and is over reaching. It will require currently approved (even currently in use) devices/systems to be modified if any regulator desires supplementary readouts. If the submitter believes a specific device type (such as truck scales) should have additional readouts it would be better addressed in the specific device code section, not the General Code. WWMA did not forward this item to NCWM, recommending that it be withdrawn.

The CWMA believes this strengthens the requirement and will promote consistency in enforcement. CWMA forwarded this item to NCWM and recommended Voting status.

The SWMA received comment from Mr. Hal Prince (FL) that the State of Florida already interprets this item the way it is written and that “ease of testing” applies to all types of devices since this proposal is for the General Code and could result in increased testing costs. The SWMA did not forward this item to NCWM and recommends that it be withdrawn because the language is unnecessary.

NEWMA believes, based on the comments heard, that this item allows more stringent authority to the official requiring jewelry scale indicators to remote scoreboards at truck scale sites to be positioned for the customer. NEWMA forwarded the item to NCWM, recommending Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200 SCALES

3200-1 V S.1.2. Value of Scale Division Units and Appendix D – Definitions: batching scale

Background/Discussion:
Item 360-3 on the 2015 Agenda of the NCWM S&T Committee was carried over as an Informational Item at the 2016 Annual Conference. The Item was opposed by the NIST OWM and the SMA because the Scales Code does not include the specific words "Batching System." The submitter of the item believed that the wording "batching scales and weighing systems" in paragraph S.1.2. was sufficient; however, the submitter agreed to work with the S&T Committee to submit an additional proposal to clarify the language. At the 2015 NCWM Interim meeting the SMA voice support for the definition for "batching system" and also suggested that a definition "batching scale" be added to Handbook 44, Appendix D. The proposed definition for batching scale is taken directly from the SMA book of "Terms and Definitions" published in their1981 Fourth Edition.

There are many batching scales and batching systems already in the market place some of which have an NTEP Certificate of Conformance. The proposed change to S1.2. and accompanying definitions will assist weights and measures official in identifying some devices as belonging in Scales Code for evaluation and testing purposes.

Some individuals believe that all automated systems utilizing a hopper scale belong in the Automatic Bulk Weighing Systems Code (ABWS). The submitter believes that NTEP and the Market Place have already demonstrated that there are devices and systems that do not need to meet some of the stringent requirements of the ABWS Code. These devices and systems are capable of providing accurate net weight without the necessity of some of the additional requirements of the ABWS Code. Those requirements add unnecessary additional manufacturing costs and testing burdens for weights and measures field officials.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-1 and 3600-3 together and took comments on these items simultaneously because it considered these items related.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes both items in this batch because it feels there are no specifications and tolerances defined to support the definition of either "batching scale" or "batching system." He also reported that the SMA would not be opposed to the creation of a new HB 44 code to address some of the weighing systems that prompted the submitter to initiate these proposals.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) submitted written comments in opposition of this item stating, "I am opposed to these items and the items should be withdrawn. The proposed definitions will confuse the categorization of scales, rather than clarify the distinction between batching scales, hopper scales, and automatic bulk weighing systems. What type of scale is a scale that automatically weighs a single commodity in multiple drafts for a single transaction? I hope that the answer is that this type of scale is an automatic bulk weighing system."

Mr. Rick Harshman (OWM) stated that OWM could not think of anything unique about a scale used in a batching operation necessitating the need for the terms "batching scale" and "batching system" be defined in HB 44 or that

the Scales Code be amended to include the term "batching system" as proposed. OWM questioned whether the exemption provided in Scales Code paragraph S.1.2. applicable to "batching scales" and "weighing systems used exclusively for weighing in predetermined amounts" should still be provided for batching scales. Mr. Harshman noted that the term "batching scale" refers to some older mechanical scales used in batching operations that are unlikely to still be in commercial service today. To this point, OWM proposed deleting the term from the Scales Code in the only two places that it appears; that is, in paragraph S.1.2. and T.3. Mr. Harshman further noted that OWM believes the definition proposed for "batching scale" is ambiguous and could be applied to just about any scale manufactured today and that by inserting the term into paragraph S.1.2., as proposed, would allow manufacturers to design scales with weight units other than those specified in the paragraph.

Mr. Richard Suiter (Richard Suiter Consulting), noting his intention to address the comments made by the SMA, reported that the two definitions in his proposals came from a handbook of definitions, which had been developed and published previously by the SMA. He further noted that the "batching system" definition in the proposal was only expanded very slightly and that the definition of "batching scale" was taken directly from the SMA's handbook. He went on to address comments made by a NIST representative, which contended that batching scales are older mechanical scales and possibly not being used in the marketplace. He stated there are, in fact, suspended hoppers in existence and in commercial use. Mr. Suiter stated that the ABWS Code is an older code and that the State of Nebraska was a key developer, so he was familiar with much of the history of its development. In countering comments submitted in writing by Mr. Oppermann, Mr. Suiter indicated that Mr. Oppermann appears to be of the opinion that any weighing system that can be operated in an automatic mode and weighs more than one draft to obtain some targeted amount for loadout is to be considered an ABWS and that the ABWS Code applies. This is not the case. There are systems that can weigh multiple drafts accurately while in automatic operation, returning to zero after each load is discharged. Mr. Suiter also clarified the comment that his proposals were submitted on behalf of KSi, "when, in fact, they were not." However, he stated he did notice it when he was affiliated with KSi. Mr. Suiter also said in response to Mr. Oppermann's comments that a lot of the scales used to weigh grain require a higher HB 44 accuracy class, which may be true, but that was based on grain being a valuable commodity, which is no longer the case in relation to other commodities. He noted that the current commodity prices are literally cents per pound. Mr. Suiter concluded by stating that he believes these proposals are ready for vote, but would like to keep the items alive if the Committee feels otherwise.

During the Committee's work session, Mr. Harshman stated that he favored following through on a comment made during the open hearings by Mr. Vires to possibly develop an entire new HB 44 code to address these systems. Mr. Harshman said he questions now whether it is appropriate to try and expand the application of the ABWS Code to address some of these automatic systems known to be in commercial service because a number of these systems weigh more than one product at a time. The ABWS Code was developed to address a particular automatic weighing system intended to weigh only one product at a time in multiple drafts to achieve some targeted amount. Mr. Suiter, who was in attendance, was asked what he thought of this idea. Mr. Suiter indicated that he too favored the concept of developing a new code, but that would take a long time and he therefore suggested the Committee present the current proposals for vote to help alleviate existing confusion.

Upon reviewing the current proposals, one member of the Committee asked other members if they considered "batching scales" and "batching systems" a weighing system used exclusively for weighing in predetermined amounts. The same Committee member indicated that if others agreed this were the case, these terms could be eliminated from paragraph S.1.2. of the proposal. Other members agreed that they believed this to be true. Mr. Suiter, who was present during the session, was then asked if the Committee removed these terms from the paragraph and kept the proposed definition of "batching scale" as part of the proposal would this satisfy his objective. He indicated that it would. In consideration of these discussions and the comments received during the open hearings on this group of items, the Committee amended the original proposal shown below to that which now appears in the Item under Consideration for this particular item and agreed to present the item for vote at the 2017 NCWM Annual Meeting.

The Committee also agreed to withdraw agenda item 3600-3 at the recommendation of the submitter, which was discussed at the same time as this item.

***Original proposal copied from 2017 S&T Publication 15*:**

Amend NIST Handbook 44, Scales Code as follows:

S.1.2. Value of Scale Division Units. *– Except for batching scales*, ***batching systems*** *and* ***other*** *weighing systems used exclusively for weighing in predetermined amounts, the value of a scale division "d" expressed in a unit of weight shall be equal to:*

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5; or

Examples: scale divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

(c) a binary submultiple of a specific unit of weight.

Examples: scale divisions may be ½, ¼, ⅛, 1/16, etc.
[Nonretroactive as of January 1, 1986]

And amend NIST Handbook 44, Appendix D – Definitions as follows:

batching scale. – Any scale which by design or construction, lends itself readily to use in proportioning admixtures by weight. 2.20

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA heard items 3200-1 and 3600-3 together. The Committee did not believe the language submitted agrees with goal and believed further development is needed by the source. WWMA forwarded this item to NCWM and recommended Developing" status.

The CWMA believes this may provide clarification when determining if a device is operating as a batching system or as an Automatic Bulk Weighing System. CWMA forwarded the item to NCWM and recommended Voting status.

The SWMA batched items 3200-1 and 3600-3 together and heard comments all items at the same time. Mr. Henry Oppermann (Weights and Measures Consulting) stated he was opposed to these items because they'll make it more difficult for the weights and measures official because the definition is not specific enough. These scales are "automatic bulk weighting systems" and this proposal was designed to exempt some scales from the automatic bulk weighing code. On page A12 in the S&T agenda, second paragraph, states "many are already in the marketplace, some of which have an NTEP certificate," but the submitter doesn't want to bring them into compliance with the automatic bulk weighing system code. Further, Mr. Oppermann stated this device has an unsealed parameter allowing the user to program a tolerance on the return to zero, which should not be allowed. The SWMA forwarded the item to NCWM and recommended Developing status. The SWMA asks the submitter to address why this is not covered in the bulk weighing code and present the overall picture of the items necessity.

NEWMA received comment that Mr. Suiter (Richard Suiter Consulting) was asked by the NCWM S&T Committee to clarify the language for the Scales Code. NEWMA believes the language is pertinent to defining a batching scale. NEWMA forwarded the item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-2 V S.1.2.2. Verification Scale Interval

Background/Discussion:
With the massive increase of the direct sale of precious metals, cannabis and other high value commodities in the market place a large number of high-resolution scales are entering the market place. Many of these scales have a display that displays a "d" value that is smaller than the "e" value. This creates confusion for both parties in the transaction. The "d" value should not be used in any direct sale transaction since it is not evaluated during device examinations and is not considered during NTEP evaluations. Conflict ensues when one of the two parties demands that the "d" value be used in the transaction while the other party understanding the requirements of device refuses to do so. Should both parties agree to use the unvalidated "d" value the accuracy of the transaction is very much in doubt.

During performance testing of the device the evaluator essentially "ignores" the smallest displayed number when "d" is less than "e." This applies even when the "e" value would round up or down if the device were not displaying the smaller "d" value. This can lead to an evaluation that is potentially not as accurate as it could be.

Oregon officials have found rampant misuse of the unvalidated "d" value on devices that have a Verification Scale Interval of ("d" less than "e") when used in direct sale applications.

2017 NCWM Interim Meeting:
During the 2017 NCWM Interim Meeting S&T Committee open hearings, the Committee heard comments from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA. Mr. Vires reported that the SMA supported the item with clarification to the order in which "e" and "d" appear in proposed new paragraph S.1.2.2.2. He stated that the order appeared reversed and further indicated that the SMA recommends the paragraph be made non-retroactive as of January 1, 2020, if adopted.

Mr. Steven Harrington (Oregon), submitter of the item, agreed to the SMA's requests to change the order of "e" and "d" in the proposal and to recommend the paragraph be assigned a nonretroactive date of January 1, 2020. Following the Committee's open hearings, Mr. Harrington submitted amended language to the Committee for consideration that addressed these issues.

Mr. Rick Harshman (OWM), stated that there may be some misunderstanding concerning how HB 44 tolerances and other requirements are intended to apply to Class I and Class II scales equipped with a value of "d" that differs from "e." He provided an overview of how HB 44 tolerances are intended to apply such scales. He acknowledged users of the scales are going to read them to the smallest increment "d" and that the tolerances and test loads specified in Scales Code Table 6 are based on the value of "e." He noted that even though the tolerances and test loads are based on "e," the scales should be considered by officials to be noncompliant if during testing, the applicable tolerance is exceeded by as little as 1 "d." With respect to the disabling of the smaller value as proposed, Mr. Harshman noted that OWM questioned:

- what the scale display might look like when "d" has been disabled;
- how officials are to test the scale and whether or not "d" should be enabled when testing occurs; and
- should the switch that enables and disables "d" be a sealable parameter?

During the Committee's work session, the amended language that had been submitted by Mr. Harrington shortly after the Committee's open hearings, was reviewed by members of the Committee. The revised language reversed the order in which "d" and "e" had previously appeared in the proposal and eliminated a portion of the proposal that addressed the means by which the smaller value "d" could be disabled.

Mr. Josh Nelson (Oregon) was asked by another Committee member to identify the issue that the State of Oregon was attempting to resolve from its submission of the original proposal. Mr. Nelson stated that Oregon had discovered in its inspections of scales used commercially to weigh cannabis, that users of the scales were reading them to and basing transactions on the closest value of "d." He stated that the value of "d" on a Class I and Class II scale equipped with a value of "d" that differs from "e" was never intended to be used in commercial trade. Mr.

Darrell Flocken (NTEP Specialist and NCWM Technical Advisor to the Committee) and Mr. Luciano Burtini (Measurement Canada's Technical Advisor to the Committee) voiced agreement that scale manufacturers did not intend for commercial transactions to be based on the value of "d" on scales equipped with a value of "d" that differed from "e." It is the value of "e" that is intended for use in commercial trade. Mr. Flocken and Mr. Burtini also confirmed agreement with the assessment Mr. Harshman had provided during the Committee's open hearings regarding how Scales Code Table 6 tolerances are to be applied to Class I and Class II scales equipped with a value of "d" that differs from "e."

The discussion of these issues by members of the Committee resulted in a suggestion being made to possibly simplify the proposal by amending it to require only that the value of "d" be equal to "e" on all Class I and II scales used in direct sale applications and assigning a nonretroactive enforcement date of January 1, 2020; this being the date suggested by the SMA in comments provided during open hearings. The Committee believed that by assigning a 2020 enforcement date, scale manufacturers would be provided sufficient time to decide how best to design scales to comply with the revised proposal given a particular scale's intended application. Other Committee members agreed this suggestion to be a good idea. Mr. Harrington, who was also present during these deliberations, was asked his opinion, and he too voiced agreement. Consequently, the Committee agreed to replace the original proposal with that shown in Item under Consideration and present the item for vote at the 2017 NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believes this item may have merit. Per request of the submitter the WWMA forwarded the item to NCWM and recommended Developing status.

The CWMA believes it is necessary to clarify which indication shall be used when commercial transactions are conducted using weights from a Class II device. CWMA forwarded the item to NCWM and recommended Voting status.

The SWMA heard comment from Mr. Henry Oppermann (Weights and Measures Consulting) that he appreciates attempting to address the confusion in transactions when *d* is smaller than *e*, but the submitter has a misunderstanding in the relationship between the two. He stated that he is opposed to this item and made a recommendation to keep this item developmental would be acceptable, but he would not support a voting status. The SWMA forwarded this item to NCWM and recommended Developing status based on comments received.

NEWMA requests clarification on the "disabling" language in S.1.2.2.2. NEWMA forwarded this item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-3 V S.1.8.5. Recorded Representations, Point of Sale Systems and S.1.9.3. Recorded Representations, Random Weight Package Labels

Background/Discussion:
This proposal would benefit consumers by enabling them to see at a glance that tare is being taken on the commodities they purchase. It would also educate the public about tare, and make them better and more aware consumers.

Retailers would benefit because this proposal would aid their quality control efforts behind the counter and at the cash register. Retailers would be able to see that their employees are taking tare on packages, and that the tare employees take is the appropriate tare. For example, a meat manager would be able to spot packages of 1 lb. hamburger which had been packaged on the night shift mistakenly using the tare for family packs of chicken, just by

walking down the meat counter and noticing a 0.06 lb. tare on a package size that would normally have a 0.02 or 0.03 lb. tare. The manager could also spot a 0.03lb tare on packages that should have a 0.06lb tare. Either way, the manager would be able to remove the items from the shelf and make corrections before the store or its customers were harmed. The manager would also be able to re-educate the employees responsible for the error. This improved quality control and transparency would build consumer confidence in retailers' establishments. It might even reduce the time and disruption retailers experience from official package inspections.

Package checking inspections potentially could be reduced because weights and measures officials could make risk-based assessments on the need to do package checking inspections at any given location. If an official notes that gross weights or tares are visible on all random-weight packages, and that the tares seem appropriate to the package sizes, the official may be able to skip that location and focus package checking efforts on locations where tares ae absent or seem inappropriate for the package sizes. That would be more efficient for both retailers and weights and measures jurisdictions.

Finally, this proposal would aid weights and measures officials investigating complaints about net contents of item by creating written proof of how much tare was taken on a given package or transaction.

Scale manufacturers will need to modify software and label and receipt designs before the non-retroactive date. Retailers with point of sale systems and packaging scales may feel pressured to update software or purchase new devices in response to consumer demand for tare information on labels and receipts. The amount of paper needed to print customer receipts may increase depending on the formatting of the information and the size of the paper being used. Some retailers may not want consumers to have this information as it will allow consumers and weights and measures officials to hold them accountable and would be written proof tare was not taken when, and if, that happens.

2017 NCWM Interim Meeting:
During the 2017 NCWM Interim Meeting S&T Committee open hearings, Mr. Doug Musick (KS), one of three co-submitters of this item, proposed splitting the item into two separate items: Item 3200-3A and 3200-3B. He suggested Item 3200-3A contain only the changes proposed to existing Scales Code paragraph S.1.8.5. Recorded Representations, Point of Sale Systems and Item 3200-3B contain only proposed new Scales Code paragraph S.1.9.3. Recorded Representations, Random Weight Package Labels. Mr. Musick also proposed, for the sake of clarity, removing the term "gross weight" from proposed new subsection "(b)" of paragraph S.1.8.5., leaving the term "tare weight" in that subsection and assigning that subsection a non-retroactive enforcement date of January 1, 2020. Mr. Musick commented that the changes proposed to paragraph S.1.8.5., if adopted, would provide consumers the additional sales transaction information needed to determine if an adequate amount of tare was taken on weighted items.

The Committee received numerous comments in support of amending HB 44 Scales Code paragraph S.1.8.5., some of which proposed additional changes to those proposed by the submitters of the item. Mrs. Tina Butcher (OWM), in presenting OWM's comments and recommendations regarding this item, emphasized the need for additional information to be provided on the receipt. She stated that it is very difficult for customers at a checkout stand to determine whether or not tare has been taken on products weighed by a store cashier in their presence on POS systems that display only a gross weight when the net weight of each package weighed is the only weight information appearing on the sales receipt. This is especially true, she said, when there are multiple items in a customer's shopping cart to be weighed. Consumers are not always able to focus their attention on the indication when individual items are being weighed and, for systems which do not display both a gross and net weight, recall those indications when reviewing a sales receipt.

Mrs. Butcher noted too, that by allowing either gross weight or tare weight to be recorded on the receipt as proposed, stores would be provided the option of selecting one method over the other. Consequently, competing stores in a given area might opt to provide different information on the receipts, thereby causing customer confusion to those customers that frequent different stores. For this reason, OWM suggested amending the proposal that the receipt provide the gross, tare, *and* net weight. As an alternative to requiring additional information be recorded on

the sales receipt, OWM suggested that the Committee may wish to draft language to require the *net weight* also be displayed on the indicator of such systems and provide some future date in which these systems must comply.

Officials from several different states highlighted, in comments provided to the Committee, the need for additional information to be provided on the sales receipt to make it possible for consumers to ensure tare had been taken on items weighed at a POS checkout.

Mrs. Julie Quinn (Minnesota), co-submitter of the item, in response to OWM's suggestion to alternatively require the net weight be displayed on the indicator, stated that even if a customer is able to view the tare indication from a POS display, there still needs to be a paper trail of the recorded transaction information for enforcement purposes. She said that she was supportive of splitting the item into two parts so as not to derail moving forward with the changes proposed to paragraph S.1.8.5. She also made note of the existence of labels on packages currently being offered for sale in the marketplace, which include recorded tare values.

The Committee also received several comments in opposition to adding proposed new paragraph S.1.9.3. Recorded Representations, Random Weight Package Labels and to Agenda Item 3200-3 as a whole.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes the agenda item and feels it would be too costly with little benefit.

Mrs. Butcher reported that OWM recommends deleting proposed new paragraph S.1.9.3. from the proposal because it conflicts with NIST Handbook 130 Uniform Packaging and Labeling Regulation, which requires a declaration of the "net" quantity of contents. Mrs. Butcher made note of a few additional points to consider relating to this portion of the item as follows:

- Those who package products in advance of sale often increase tare values to take into account moisture loss and good distribution practices. Thus, it cannot be determined from a tare value specified on a package how much of that value represents the packaging material and how much represents additional deduction.
- Tare values on packages cannot be enforced and do not provide indication of whether or not the declaration of net contents specified on a package is correct.
- Displaying a declaration of both gross weight and net weight on a package would confuse consumers.

Mr. Ross Anderson (NY retired) commented that he didn't see a great amount of benefit to Item 3200-3B.

Additionally, the Committee acknowledged receiving written comments from Ms. Elizabeth K. Tansing, on behalf of the Food Marketing Institute, opposing the item and requesting that the Committee withdraw it (i.e., the item as a whole).

During the Committee's work session, members of the Committee agreed, based on comments received during open hearings, to simply delete proposed new paragraph S.1.9.3. from the proposal rather than split the agenda item into two separate items as suggested by Mr. Musick during the Committee's open hearings. Members of the Committee also agreed to amend proposed new subsection (b) of paragraph S.1.8.5. by deleting the words "gross weight or" from the proposal and assigning subsection (b) a nonretroactive enforcement date of January 1, 2020. The Committee agreed to present the item, as amended by the committee, for vote at the 2017 NCWM Annual Meeting. All of the changes agreed to by the Committee are included in the proposal as shown in the Item Under Consideration.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believed the addition to section S.1.8.5. has merit and should be considered as a voting item. However, it also believed section S.1.9.3. should be withdrawn and perhaps a better place for this consideration would be with the L&R Committee. The WWMA forwarded the item to NCWM and recommended that it be a voting item as modified below.

S.1.8.5. Recorded Representations, Point-of-Sale Systems. – The sales information recorded by cash registers when interfaced with a weighing element shall contain the following information for items weighed at the checkout stand:

(a) the net weight;[1]

(b) the gross weight or tare weight;[1]

(**~~b~~c**) the unit price;[1]

(**~~c~~d**) the total price; and

(**~~d~~e**) the product class or, in a system equipped with price look-up capability, the product name or code number.

[Non-retroactive January 1, 20XX]

[1] For devices interfaced with scales indicating in metric units, the unit price may be expressed in price per 100 grams. Weight values shall be identified by kilograms, kg, grams, g, ounces, oz, pounds, or lb. *The "#" symbol is not acceptable.*
[Nonretroactive as of January 1, 2006]
(Amended 1995 and 2005)

And

~~S.1.9.3. Recorded Representations, Random Weight Package Labels. A prepackaging scale or a device that produces a printed ticket as the label for a random weight package shall produce labels which must contain the following information:~~

~~(a) the net weight;[1]~~

~~(b) the gross weight or tare weight;[1]~~

~~(c) the unit price;[1]~~

~~(d) the total price; and~~

~~(e) the product class or, in a system equipped with price look-up capability, the product name or code number.~~

~~[Non-retroactive as of January 1, 20XX]~~

The CWMA believes that this code requirement provides consumers with the necessary information to determine if tare is taken when an item is pre-packaged or at the point of sale. CWMA forwarded this item to NCWM and recommended Voting status.

The SWMA did not receive comments for this item and asks the submitters to provide information based on costs involved, in particular for the POS component. The SWMA forwarded the item to NCWM and recommended Developing status.

NEWMA believes the upgrade to POS systems, education to all store owners, large and small grocery stores, time to implement and confusion of the customer are all of concern. NEWMA did not forward this item to NCWM and recommends that it be withdrawn.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-4 D Table 3, Parameters for Accuracy Classes (See related item 3200-8)

Background/Discussion:
The content of NIST Handbook 44 has been driven by the ongoing development of weighing devices. This is quite apparent when viewed for the purpose of certifying in-motion rail weighing systems. These devices have been developed from static, platform-type scales that utilize one or more very accurate load cells, and the Handbook seems to assume that the devices will also be used for static reference weighing.

Meridian Engineers asks that you consider their in-motion weighing rail weighing system, which has been in production and development for 15 years. It already has trade approval in Australia (National Measurement Institute) and the EU (National Measurement Regulation Office) and they are now looking to gain NTEP Certification.

The product utilizes what they refer to as bolt-on transducers, which make the rail a pseudo load cell. They are not designed to be used as a conventional load cell that can be connected to a standard load cell indicator. They are only designed for the end application i.e. coupled, in-motion train weighing. Furthermore, their product is not attempting to perform static reference weighing.

Because they bolt their transducers onto existing railway line, they cannot change its sectional properties to increase performance or accuracy. Also their transducers do not carry zero-shift compensation because the overall system is constantly digitally zeroing the system typically after every 4th axle weighed. Hence there has been no need to incorporate conventional zero-shift compensation into the manufacturing of our transducers.

In this application the errors from the quality of the rolling stock, the track foundation condition, as well as how smoothly the locomotive drives across the system are significantly higher than the individual class IIIL permissible errors.

All this means the accuracy of their "load cell" would struggle to meet Class IIIL requirements as they currently stand. Yet the accuracy of their system is as good as any system designed with Class IIIL load cells for coupled in-motion weighing.

The requirement to have load cells pass IIIL accuracy requirements for coupled in-motion train weighing is not appropriate and restricts the design of the final system to more conventional platform style systems, which is detrimental to innovation. This requirement is too stringent and they would argue that the final accuracy of the complete system should dictate how accurate the load cells need to be.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-4 and 3200-8 together and took comments on these items simultaneously because it considered them related.

Mr. Richard Suiter (Richard Suiter Consulting) gave a short presentation on behalf of Meridian Engineers Pty Ltd. that provided an indication how the Meridian Engineering equipment functioned and showed some of the test data

that Meridian had collected to support the changes proposed. It was stated that the proposed changes would harmonize the tolerances for in-motion railroad weighing systems in NIST HB 44 with those in OIML R 106 Automatic Rail-Weighbridges. Mr. Suiter acknowledged that the impact of changing the HB 44 tolerances is not yet fully known and needed further study. Mr. Anthony Pruiti (Meridian Engineers Pty Ltd.) stated he intended to continue working on this item and planned to have more information available at the upcoming NCWM Annual meeting.

Mrs. Tina Butcher (OWM) noted that while establishing different accuracy classes for weighing devices would not be unprecedented, if this were done specifically for coupled-in-motion railroad weighing systems as proposed, each accuracy class would also need to define the application of the weighing systems assigned that accuracy class. She further noted that while OWM could envision this possibly being done, it questioned the need for it and wished to defer opinion until more information has been made known justifying the reason.

Mr. Rafael Jimenez (Association of American Railroad Transportation Technology Center) commented that the AAR takes no position on this item and that the American Railway Engineering and Maintenance-of-Way Association's (AREMA) Committee 34 planned to review and analyze the test data that had been collected on the Meridian systems.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, stated that the SMA takes no position on this group of items. This is a significant change to the code and the impacts are not fully known. The proposal introduces new classes and changes the concept of a scale being comprised of an NTEP-certified indicator, a weighing/load receiving element, and load cell(s). The SMA looks forward to the review and input from other interested stakeholders.

A regulatory official from Oregon cautioned on "relaxing" the tolerances and the negative impact that such action would have on customers.

Mr. Steve Beitzel (Systems Associates, Inc.) stated that the railroad weighing systems offered by Systems Associates can consistently pass the current tolerances in HB 44. Adoption of these proposals would create an unfair playing field and an imbalance in the market. He said that when Systems Associates installs a railroad weighing system outside the US, it tests those weighing systems using U.S. tolerances.

It was noted during the Committee's work session that this item did not appear on the regional agendas of the S&T Committee in three of the four regional weights and measures association meetings. In consideration of the comments received during the open hearings, the Committee agreed to assign a "Developing" status to the two items in this group.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
NEWMA S&T Committee recognized the effort made by the submitter to travel from Australia to attend NEWMA. The item is not so pertinent in the Northeast but NEWMA recognized that the other regions may benefit from this proposal so they forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-5 D Table 3, Parameters for Accuracy Classes (See related items 3100-1 and 3600-2)

Background/Discussion:
The submitter provided the following comments:

Some are now coming to understand that the NCWM made a mistake in 1990 in interpreting how we apply the code requirements to the three-platform, three-indicator truck scale with a fourth summed indication. In any suggestion that a code should be changed or reinterpreted, there is an unstated requirement that there must be some conflict that needs resolution. Often the difficult part is in just identifying the conflict or in finding the right question to expose the conflict to others and, in doing so, possibly point to the resolution. Some might think there is no conflict and there is no issue, but I must disagree.

What stands out on this issue to me is the huge divide between the public sector and private sector on this issue. It was black and white in 1989, good guys vs the bad guys. The public sector, me included, saw the issue one way while the scale industry almost unilaterally saw it differently. As I think back over my career, I find it hard to find many issues where consensus between the two sides eluded the NCWM as it did for this issue. In my experience, the scale industry works toward consensus as earnestly as the public sector. If there is no consensus here, this should bother us all and encourage us to try to understand why.

If we ask the question on our current issue, as Henry Oppermann has, it goes like this: How do we apply the Scales Code requirements to a three-platform scale with three independent weight indications and a fourth indication of the sum of the three independent platforms? His answer follows his logic of the "duck test." Quoting him, "if a scale looks like truck scale, operates like a truck scale, and weights trucks, then it is a truck scale."

It is important to note that a parallel issue was on the 2016 S&T agenda dealing with the v(min) requirement for these three-platform scales with three independent indicators. However, in dealing with this small part of the larger issue, the Committee has chosen to ignored the larger issue for now. In my testimony at the 2016 interim meetings, I pointed out that the v(min) change would result in a mixed state of being. Part of our interpretation would treat the three scales as three i.e. for v(min), but treat them as one for all other requirements. Does this make sense?

I see an immediate problem here, as Henry's quote is based on thinking from 1989, and I'll suggest much earlier, pre-1986 to be exact. We can see this in Tables 7b. and 7a. in the Scales Code. These tables deal with selection requirements for unmarked scales and marked scales. Table 7b. reflects that pre-1986 thought process where the application of the unmarked device determined what technical and performance requirements would apply. This is the model implied in Henry's comment and in the thought process we see from the S&T Committee as it wrestled with this issue in 1990. Quoting from page 157 of the 1990 S&T final Report: "The classification of a scale or weighing system into an accuracy class should be based upon its application and method of use, not on the design of the device." In the same paragraph the report also notes, "The significance of this interpretation is that not only must each independent weighing device meet the requirements of Handbook 44, but the entire weighing system must meet all requirements that would apply <u>if the device were a single scale</u>." (emphasis added) This was voted on and approved by the public sector voters of the NCWM with strong (non-voting) opposition from the scale industry.

Looking at that last statement in the S&T report today, does it even make sense? Table 7a. made a radical departure from the pre-1986 way of thinking. Under the "New" Scales Code which took effect January 1, 1986, the technical and performance requirements were determined by the class designation that was chosen and marked on the device by the manufacturer. In the wording of the table, it is a typical application of the class. Thus the requirements apply based on the class designation as marked by the manufacturer and the device is adapted to the application. To me this contradicts the S&T conclusions in 1990.

I'm suggesting that a "duck test" is not valid for marked devices. For example, there is no single set of requirements for a marked truck scale. By this I mean one can use a class III or a class IIIL scale to weigh trucks and the requirements are therefore very different. This was impossible to imagine prior to 1986 under the "Old" Scales Code. It is the manufacturer, in the design and production phases, who determines and marks the class. It is the marked class that determines which technical requirements will be applied to the device, and this is done before it leaves the plant. The code recognizes that the manufacturer has no means to limit the application once the purchaser buys the device. Whether a device is suitable is a separate question and has a separate requirement, i.e. G-UR.1.

I believe the "duck test" is not valid for the entire Handbook. For me the critical issue we have to address is how to apply code requirements in general. The simple direct answer is, we apply code requirements to a device. That is how the requirements are written, in the singular. Why is this singularity important? The answer lies in unstated general principles in Handbook 44 which we can elicit by asking, "How do we measure quantities of things in commerce, generally?" By generally, I mean across all codes. My answer is that the codes clearly allow multiple solutions to that question. I'll state this more specifically:

A commodity exchanged in commerce may be measured:

A. as a single draft measured using a single measuring instrument.
B. as the sum of measurements of sub-parts of the whole using multiple drafts on a single measuring instrument.
C. as the sum of measurements of sub-parts of the whole using multiple drafts of multiple measuring instruments.

It must be noted that the instrument used in any of the options A through C, must be suitable for service when measuring the whole or the sub-part in conformance with G-UR.1. For the purposes of this discussion we will stipulate that all measuring instruments involved are suitable for service, whether measuring the whole or the sub-part. For example, all weighments are stipulated to be greater than the recommended minimum load in Table 8 or liquid quantities in conformance with G-UR.1.3.

A couple of examples might help. I don't think I need to illustrate option A, as it is the most common solution. Option B can be seen with an Automatic Bulk Weighing system which operates by summing multiple drafts weighed on the same scale to provide a total weight of the whole commodity. But I could also do option B using VTM's. I could make multiple deliveries from a single VTM unit to fill a large customer order, i.e. larger than the tank capacity of the single VTM. Alternatively, I could fill that order using drafts from multiple VTM units, option C.

Our assumption in accepting each of these options is that the sum of measurements from multiple compliant instruments is de facto compliant. In fact, the reason that we use multiple drafts in the first place is that the total will probably exceed our ability to verify the quantity of the whole, even if we wanted to! Going back to our examples, how could we verify, after the fact, that the 1,000 tons of grain loaded on a barge from an ABWS system with a 50,000 lb capacity scale is accurate? That's at least 40 drafts.

What becomes very clear to me in the general case is that the technical and performance requirements are applied to the individual device without regard to the summed total. It seems this summed total has always been the crux of the issue. Does this summed indication now link the three independent platforms with their independent indication in a way that makes them one device for legal purposes? This is what the S&T Committee decided in 1990. Some would continue to say yes and some would say no. However, there is the law to consider. By law, I mean the general rules of construction of legal requirements. In construction we must not be arbitrary and capricious. I believe those that say the three scales are one scale are being arbitrary and capricious.

To see how this is so, consider what UR.3.3. Single-Draft Weighing means. Below is the current HB44 text.

UR.3.3. Single-Draft Vehicle Weighing. – A vehicle or a coupled-vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination. However, the weight of:

(a) a coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results; or

(b) a vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform.

The first sentence makes it clear that this is not a general provision as it limits the scope of the requirement to "a vehicle or a coupled-vehicle combination." It now goes on to say that any entity fitting one of those two descriptions shall be weighed as a single draft. Note that this is option A from the general case above. The paragraph goes on to provide more explanation of what single-draft means.

Then we come to a "However," indicating there are viable alternatives to the single-draft requirement. Alternative (a) allows the coupled combination to be divided into sub-parts that are weighed separately and the weight of the coupled combination is found by summing the individual weights of the sub-parts. Alternative (b) says that a vehicle or a coupled combination may be suspended simultaneously on more than one scale and the weight is found by summing the indications of the multiple scales.

On first glance we might think that alternative (a) is option B from the general case, and alternative (b) is option C. However, closer reading will show that is not the case. Look carefully at the wording of alternatives (a) and (b). You cannot equate (a) with option B since (a) does not limit you to a single scale. You might assume that the multiple parts would be weighed on the same scale, but the code does not stipulate that. To do that the code would have to add the words, "on the same scale," i.e. …. weighing each unit separately <u>on the same scale</u>, and adding together the results; " What I'm pointing out is that (a) as it is now written allows either general option B or C. By this I am considering the case where there are multiple scales available at the site. Each of those scales might have capacity 200,000 x 20 lb. For example, think about one of those three component trucks (tractor, trailer, and pup). Alternative (a) allows you to uncouple and weigh the three sub-parts on three scales, two scales, or one scale in full compliance with the code.

Now it becomes clear that UR.3.3. is addressing the real issue with weighing large vehicles and coupled-vehicle combinations, and that is shifting loads and coupler interactions. In alternative (a) you eliminate both interferences by isolating each part on its own scale. In alternative (b) by supporting the vehicle or combination on multiple scales, any shift in the load or coupler interaction cancels out. If load shift or couple interference reduce the weight on one platform it increases, it on another. Of critical importance, the three-platform scale, that is the focus of this discussion, is an application of (b) where the load is supported simultaneously on more than one platform and the individual indications of the three scales are summed to get a total. There is no other way to describe what is happening since the total indication is, in fact, a sum of the weights from the three separate platforms. Also of critical importance, there should be no expectation whatsoever that the sum valued obtained in alternative (a) will be <u>identical</u> to alternative (b).

However, getting back to the question about three scales or one, it should now be clear that the Handbook clearly allows summed indications from multiple devices using options B or C. If the S&T statement is correct, then the code requirements must be applied across two scales or three scales in the example of multiple scales at a site. Thus the three, one-hundred ton scales have a combined 30,000 divisions according to that interpretation. This would virtually preclude having multiple scales at the same site as they might be used to weight a single coupled-vehicle combination in pieces. Even going to 50 lb divisions still puts them out of compliance. Also, you have to consider the shift test requirements, which now require agreement of sections across all three scales!

Finally, we have to consider other cases of three independent scale platforms configured to weigh trucks. In case one, each platform has a stand-alone independent indicator and the three indications are manually summed by the operator. In case two, each platform has an individual indicator but all three indicators are housed in a single enclosure. Again the summing is done manually by the operator. In both of these cases the three independent instruments remain independent under the 1990 decision. This is what I mean by arbitrary and capricious.

Now suppose I can weigh a coupled-vehicle combination on three platforms with three separate indicators and manually add the indications to obtain a total weight for the combination. As I understand the 1990 decision, those three scales do not have to meet requirements like the number of scale divisions extended across all three scales. That extension only applies it there is a single weight display for the three scale indications and a fourth electronic indication for the sum. The results obtained are absolutely identical in function (adding manually on paper or having the system add them up) yet you are applying different requirements to the three scales depending on whether you are doing it manually or electronically. Isn't that being blatantly arbitrary and capricious?

Move over to the VTM example, and the three VTM units used to fill that order, must those three meters be treated as one meter, think about repeatability tests. It doesn't make sense for scales, nor does it make sense for any of the other codes. Thus I argue that options B and C allow the summing of multiple devices without forcing them to be considered one instrument for applying code requirements. I believe the HB needs to say that explicitly to avoid confusion.

I offer one additional item of support. I found reference that this issue has been raised internationally. Sections of the 2009 WELMEC guide to Non-Automatic Weighing Instruments addresses this issue quite clearly (see pertinent sections on the final pages of this document). Point 3.1.16. in the Guide addresses the same issues as UR.3.3. where multiple platforms are used. The applications coincide with those I expressed in this discussion paper. Also I believe point 3.1.54. addresses the use of multiple axle-load scales to weigh a vehicle. It also supports the conclusion that the individual axle-load scales do not become a single instrument for compliance purposes. In extension, if 3.1.54. does not apply MPE (tolerances) to the summed indication, it also does not extend other technical requirements such as v(min) [which the NCWM has addressed], n(max), shift test, etc.

The fundamental Considerations change is necessary to spell out clearly that code requirements do not extend across multiple devices unless specifically stated. A good example is the application of the code to wheel-load weighers designated as and used in pairs. For those scales designated as pairs, many authorities apply the tolerances only the combined indication of the pair. None of the other requirements applicable to the wheel-load weigher is affected by this exception. For example, the combined number of divisions for the pair is not limited to 1,200 as in Table 3. Other requirements like identification markings, rules for indicators, zero load adjustments, etc., remain applicable only to the individual wheel-load weigher and not to the pair.

The addition to G-S.5.2.2. is necessary since you can't write requirements into the Fundamental Considerations. That section is there to help understand how to apply what is written in the codes. You must have a specification that the electronic sum be mathematically correct to reference if there is non-compliance. That is: readings from three scales of 107, 206, and 98 must result in an electronic sum of 411.

Note 4 in Table 3 has to be changed, since the last two sentences address these instances of multiple independent scales and reflect the 1990 decision. The removal of the last sentence removes the summed indicator from consideration under the classification system as discussed above, since the summed indication is not a directly measured quantity and is not subject to class requirements. The summed indication is also not subject of requirements to n(max), tolerances, etc. When this last sentence is removed, it makes the next to last sentence unnecessary. Since each of the independent scales are already covered under the general provisions of the Table.

There is a small side issue regarding multiple devices using option C where the division size is not the same for all the devices. The general principle, i.e., that summing the indications from compliant devices is a valid way to measure a commodity, does not necessarily require that division sizes of the individual devices be identical. Note that you might want to apply UR.1.3. to printed records from the three scales. However, the new Fundamental Considerations paragraph exempts the summed indication since code requirements do not apply to the summed indication except the mathematical correctness. Also the summed indication is a sum not a representation of a scale division. It is just a sum of the values obtained from the individual compliant devices. The individual weights are also required to be shown on any record of the transaction. While the different division sizes may offend our sensibilities a little bit, on what objective basis can we say it violates the general principle, i.e. the sum of multiple compliant measurements is also de facto compliant. It is this compilation of original sources for the sum and the sum that provides the transparency for the transaction. Note the WELMEC reference indicates this is the position taken by many internationally.

I can think of another possible situation in the case of multiple ABWS systems. Suppose you are loading to a single barge from two sources where the two ABWS scales have different division sizes. The scale controller interfaced to the two scales now can print each of the weighments from each of the two scales and a single total for the entire transaction. The sum need only be mathematically correct since it is a mathematical sum of independent, compliant weighments.

From May 2009 version of WELMEC Directive 90/384/EEC: Common Application Non-Automatic Weighing Instruments (available at www.welmec.org/latest/guides/)

3.1.2 Calculated weight (Meeting 10, Decision 10)

Where the indication represents an actual determination of the weight then the indication must respect the error allowance and be presented in the correct format.

When gross, net and tare are printed together, weight may be calculated from two actual determinations of weight. In the case of a multi-interval instrument it would be allowed to print a calculated value with the least significant digit which need not be rounded to the relevant scale interval.

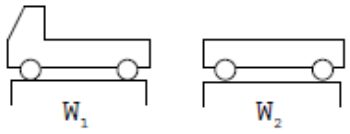
Any printout of the calculated weight values should be identified as calculated weight values.

(See also Sections 3.1.16 and 3.1.54)

3.1.16 Combined and multi-plate weighbridges (Meeting 14, Point 4, Meeting 15, Point 2 and Meeting 18, Point 9)

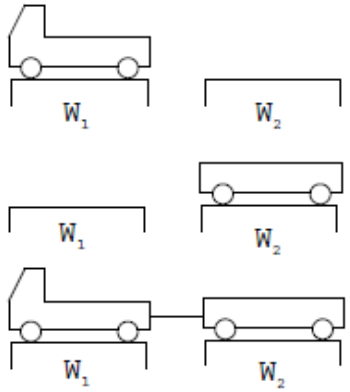
This concerns weight obtained by using adjacent weighbridges. Acceptable solutions, with examples, are shown below:

Two weighbridges, each with its own indicator:



W_1 = 30 t x 10 kg
W_2 = 30 t x 10 kg
(Two indicators; simultaneous indication necessary)
Calculated weight 60 t x 10 kg
(mpe does not apply to calculated weight)

Multi-plate weighbridge with one indicator:



W_1 = 30 t x 10 kg

W_2 = 30 t x 10 kg

W_{1+2} = 60 t x 20 kg

W_{1+2} is a weighing range (Compatibility of modules and mpe must be satisfied for it)

(See also Sections 3.1.2 and 3.1.54)

3.1.54 Vehicle weighing by summation of individual wheel load NAWIs ("axle weighers") (Meeting 25, Point 9)

If the total weight of a vehicle is calculated automatically by summing the individual weight values produced by individual wheel load NAWIs ("axle weighers"), the system is not to be regarded as being one single NAWI. The mpe does not apply to calculated weight.

(See also Sections 3.1.2 and 3.1.6)

3.1.6 Load cells

(Note that throughout this guide, "load cells" refers to analogue load cells rather than digital load cells unless stated otherwise.)

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3100-1, 3200-5 and 3600-2 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3100-1 for

a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes this item is fully developed and forwarded it to NCWM, recommending Voting status.

The SWMA batched items 3100-1, 3200-5 and 3600-2 together and heard comments for all at the same time. Mr. Henry Oppermann (Weights and Measures Consulting) disagrees with these items and opposes them. He recommends withdrawing all three items in this batch. Mr. Oppermann contends they violate the principles of Handbook 44. He further contends this should be on performance and not design. Mr. Oppermann concluded by stating the submitter misinterpreted the WELMEC guidelines and multiplatform truck scales used together have to function as a single scale. The Committee did not forward these items to NCWM and recommends they be Withdrawn because the proposed language is unnecessary.

NEWMA believes this item has merit; however, the Committee would like an example of how this applies to independent/multiple devices. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-6 D N.1. Test Procedures

Background/Discussion:
During a NTEP evaluation test a dangerous situation arose when the shift test for the left and right side were performed with half-capacity because the pallet on which the test weights were placed is not supported adequately in that direction and tends to tip over. To prevent accidents from happening with inspectors in the field the submitter advises to skip this side-shift test and concentrate on the front/back shift test because that's more in accordance with the practical use of the forklift truck.

Safety should be a priority. In practice forklifts are never loaded sideways because the load could be lost when turning the vehicle, possible damaging valuable goods.

2017 NCWM Interim Meeting:
During the Committee's opening hearings at the 2017 NCWM Interim Meeting, comments were heard from representatives of NIST and the SMA.

Mr. John Barton (OWM) stated that OWM recognizes the unique design characteristics of the load-receiving elements associated with on-board weighing systems (to include forklift scales), and believes it is appropriate that testing should be performed in consideration of the design of a device. He noted that the proposal omits testing involving centering the test load to either side (right or left) of the load-receiving element due to safety concerns; whereas, testing should encompass the usual and customary manner in which a device is used. Normal use would predictably include loads concentrated on either side of the load-receiving element and if so, practical procedures that do not compromise safety should be developed and provided. He further noted that NCWM Publication 14 contains procedures for conducting shift tests on forklift scales and said it may be appropriate to include those procedures in the proposal.

With respect to the two-sentence paragraph proposed for addition to existing paragraph N.1.3.2. Equal-Arm Scales. – Mr. Barton noted that it is more appropriately associated with paragraph N.1.3.6. Vehicle On-Board Weighing Systems.- which already includes some details regarding shift-tests for this type of device. Mr. Barton also noted

that some of the verbiage in the proposal, e.g., "load-gravity point," is not clearly understood and may need to be defined in HB44.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA supports this item with the following recommended change:

- Remove the proposed language in N.1.1. and N. 1.2.; and
- Create a new subsection N.1.3.X. for the proposed paragraph currently listed under N.1.3.2 Equal- Arm Scales.

In consideration of the discrepancies identified by those offering comments to the Committee on this item, and the need to further develop the proposal, the Committee agreed to assigned this item a "Developing" status.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes this item has merit but additional tests may need to be developed to evaluate the ability of these devices to adjust the weighing element from side to side and in a tilting motion forward and back. CWMA forwarded the item to NCWM, and recommended Voting status.

The SWMA did not receive comments for this item. The Committee believes it would be better suited in an EPO. The SWMA did not forward this item to NCWM and recommended that it be withdrawn.

NEWMA believes the test procedures are adequate in this section. NEWMA did not forward this item to NCWM and recommends that it be withdrawn.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-7 W T.1. General and T.N.2.1. General (See related items 3201-1, 3204-1, 3205-1, 3508-2, 3509-1 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each code has a specific statement along the lines of:
>
> The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
> or
> The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.
>
> However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
2.21	Belt-Conveyor	Not specified
2.24	AWS	positive/negative
2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.

Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gallons that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related.

The Committee received comments from Mrs. Tina Butcher (OWM), who reported that OWM believes the application of tolerances is already adequately addressed in the General Code of HB 44 and that the changes being proposed to the different device codes was unnecessary. She also indicated that perhaps a more practical solution, should the concepts of overregistration and underregistration not be understood, would be to amend the definitions of these terms in HB 44.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA took no position on this group of items.

Mr. Ross Andersen (NY retired) stated that he had submitted these proposals in an attempt to make the language in the different codes of HB 44 consistent. The meaning of the terms "underregistration" and "overregistration" is confusing to officials because of the way that they typically view the errors observed during the testing of different device types. He offered the following two examples to substantiate his comment that the meaning of the two terms is confusing:

1. The direction of error observed during a scale test is typically determined relative to the indication (i.e., error of indication) when a test weight is applied. Thus, a plus error occurs when a scale provides an indication greater than the value of the test weights applied, and for this reason, the scale is said to be "*overregistering*" (i.e., registering more than the amount of test weight actually applied).
2. In contrast, the direction of error observed during the testing of a liquid-measuring device using a volumetric prover is typically determined relative to the amount of product delivered (i.e., error of delivery) into the prover during a test. Thus, a plus error occurs when the amount of product delivered into the prover is more than the amount indicated by the device being tested, and for this reason, the device is said to be "*underregistering*" (i.e., registering less than the amount actually delivered).

Mr. Andersen noted that all errors in OIML Recommendations are considered "errors of indication," thus, providing for a uniform way of expressing errors.

During the Committee's work session, the Committee agreed that uniform language in the codes is good when the application is such that there is enough commonality to permit it. However, with this proposal, the changes were felt to potentially lead to confusion in codes that currently have adequate language to facilitate application, and that the changes were unnecessary. Ultimately, the Committee agreed to withdraw these items.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3200-8 D T.N.3.6. Coupled-in-Motion Railroad Weighing Systems (See related item 3200-4)

Background/Discussion:
The proposed changes to Handbook 44 come directly from OIML R 106-1 Edition 2011 (E) Automatic rail-weighbridges. Introducing a range of accuracy classes is more appropriate for these types of weighing systems, given they are mounted on continuous rail and are highly influenced by track conditions, the quality of the rolling stock as well as locomotive driving.

While clause T.N.3.6.1 can be achieved, the submitter contends that clause T.N.3.6.2. as it appears currently is simply not achievable for the vast majority of installations. Using a typical example of a weighing system required to weigh in the range of 15t to 100t and a 50kg scale division, this clause essentially states that 65% of individual wagons must have no more than 0.2% error and no single wagon have an error of more than 0.6%. According to the submitter, this is not possible for most real life applications. The only way this could be achieved is with perfect track conditions, perfect locomotive driving and perfect rolling stock couplers. The real word typically achieves 90% of wagons at no more than 1% error. The permissible errors currently detailed in T.N.3.6.2 are more akin to

weighing wagons uncoupled statically on isolated rail, not for coupled in motion train weighing systems on continuous, uncut rail.

The submitter's equipment, when installed on the best tracks with best rolling stock actually achieves 0.1% accuracy. However, the same equipment installed on substandard tracks and rolling stock will only achieve 1% accuracy. Unless the client spends significant time and money on upgrading track and rolling stock, there is no way they can get a coupled in-motion train weighing system to weigh better than 1%. So in most cases this would not be financially viable.

Aligning Handbook 44 with OIML R 106 also has wider advantages that can be appreciated i.e. systems developed for NTEP certification will also be able to achieve certification in other countries that have adopted the OIML R 106 standard and vice versa.

Establishing a range of accuracy classes will encourage innovation and bring a wider range in design and type of products to the table. There are also opportunities to establish the "lesser" classes as being suitable for infrastructure protection and safety.

The current requirements would mean far greater overall costs to implement an NTEP certified system. It would also typically be far less flexible, in terms of speed range and modes of weighing, than if the tolerances were widened as we are proposing. If our proposal is adopted, more efficient weighing systems would become available, which would be installed at a lesser cost, with a minimum reduction in accuracy.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-4 and 3200-8 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-4 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
NEWMA S&T Committee recognized the effort made by the submitter to travel from Australia to attend NEWMA. The item is not so pertinent in the Northeast but NEWMA recognized that the other regions may benefit from this proposal so they forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3201 BELT-CONVEYOR SCALE SYSTEMS

3201-1 W T.1. Tolerance Values (See related items 3200-7, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each code has a specific statement along the lines of:

The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
or
The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.

However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
2.21	Belt-Conveyor	Not specified
2.24	AWS	positive/negative
2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.

Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gallons that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-7 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3202 AUTOMATIC BULK WEIGHING SYSTEMS

3202-1 D A. Application, S Specifications, N. Notes, UR. User Requirements

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Doug Musick
Kansas Department of Agriculture
785-564-6681
dmusick@kda.ks.gov

Background/Discussion:
The submitter provided the following points of discussion:

- There are many systems in use that don't meet the definition for a "scale" or an "Automatic Bulk Weighing System" or anything else in the Handbook. These changes will make it easier for regulators/inspectors to determine if a system should be evaluated as an "ABWS".
- The wording "automatic bulk weighing systems" should not be used in the definition of the same.
- The no load and loaded weight recordings are important, but they are specifications and should not be included in the application code.
- The current code does not clearly define at what level of automation a system would be considered an ABWS versus a scale with some accessory equipment (hopper, tank, etc.). This is an attempt to more clearly distinguish which systems should be considered ABWS's.
- Human intervention could be many things. Some examples include but are not limited to pushing a reset button, turning power off then back on, typing a password, or entering a statement into a system log. The intent with including the term "human intervention" is to not include all systems which have a high degree of automation, only the ones that cycle repeatedly and can potentially operate without anyone present to observe weighing malfunctions.
- There are many types of load receiving elements that will work with an ABWS to include but not limited to tanks and hoppers so the previous language referring to hoppers was removed and replaced with the generic but accurate term "load receiving element".

- The old language implied separate sensors (e.g. bindicators) were required. Newer systems have already bypassed the use of separate sensors and utilize the weight indications to identify an overfilled condition, similar to how the indications are used to regulate product flow into the load receiving element for some devices. Concerns for this approach have been raised for situations when an indicator is not functioning properly. That is a legitimate concern, but my reply then is: What is the backup for an indicator not indicating properly on any other type of device? This is something we know happens with other devices and commonly may not be detected until a device inspection and test is completed. Thus one reason routine inspections and testing are required.
- Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, and buckets. Examples would be a conveyer delivering product – in such a case the recording element should not record if the conveyer is still moving or in the case of a pneumatic transfer tube the recording element should not record if the blower forcing air through the tube is still operating. Therefore, the old language referring to gates was removed and replace with more generic terminology which can be applied to any equipment used to control product flow not just gates.
- Many types of equipment can be used for downstream commodity storage including but not limited to hoppers, tanks, bins, flat storage, trucks, totes, rail cars and pits. The language referring to "lower garner", "surge bin", etc. has been removed and replaced with a more terms such as "downstream storage devices" to allow for all potentials types of product handling equipment.
- A downstream storage device itself may not interfere with the weighing process directly, but it also cannot create a situation in which an overfill condition or some other malfunction of the equipment interferes with the weighing process. An example would be a grain storage hopper located under a weigh hopper in a position which when grain is mounded up above the storage hopper the grain touches the bottom of the weigh hopper and interferes with the weighing process. For this example, if the storage hopper can be lowered far enough below the weigh hopper so that the mounded grain when it reaches its' maximum potential height cannot touch the weigh hopper then it would not need the capability to detect an overfill condition. The same scenario would apply to a truck parked under the load receiving element, or a conveyer under the load receiving element. Wording was added to ensure interference does not occur and if it does that the system activates controls to prevent weighment errors.

The original code was written for very specific equipment for a very specialized use. This is a fairly drastic change from the original and introduces some new terminology that may present some confusion or uncertainty to those who were fairly familiar with the existing code. Some individuals feel the proposed changes may add some uncertainty as to what systems should or shouldn't be considered an ABWS.

2016 NCWM Interim Meeting:
At the Committee's 2016 Interim Meeting open hearings, Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, commented that SMA looks forward to the further clarification of this item.

Mrs. Tina Butcher (OWM) noted the single-most important factor in determining whether or not an automated weighing system needs to take into account the no-load reference and gross-load reference to determine an accurate net weight for individual drafts weighed is the system's ability to consistently return to zero following discharge of the load. This determination must be made on a case-by-case basis and will vary depending on the design of the system and the products being weighed.

OWM recognizes the need for HB 44 to include requirements that address some ***automated*** weighing systems currently in the marketplace that, for one reason or another, fail to meet the definition of an ABWS or the application of the ABWS Code. As is the case with an ABWS, these systems are also used to weigh bulk commodities in an automatic operation. A number of these weighing systems do ***not*** consistently return to zero following discharge of a draft load due to:

- the density of the commodity being weighed and its susceptibility to cling;
- structural deformations in the load-receiving element (which trap and prevent product from being completely discharged);
- venting issues;

- system vibration; etc.

Mrs. Butcher noted, for example, that OWM is aware of *some* seed treatment systems that will automatically fill to some targeted load (preset by the system operator) by weighing multiple drafts *automatically* and *without* operator intervention. Similar automated systems used to weigh other products are also known to exist. When these systems are operational, not all of the weighed product necessarily gets discharged with the draft load. The remaining product is typically referred to as a "heel." Some of these systems only record the gross weight of the different drafts weighed; yet, the "heel" remaining for each draft load cycled through the system needs to be taken into account for an accurate determination of the net quantity to be made. OWM believes this proposal is an attempt to address such systems. Mrs. Butcher also acknowledged the existence of weighing systems that ***do*** consistently return to zero following discharge of the product when being operated in automatic mode. She stated that for these systems, the Scales Code is intended to apply.

Mrs. Butcher further reported that OWM believes more work is needed to develop the proposal. She suggested that the submitter might propose that the definition of "automatic bulk weighing systems" be amended to apply to systems that weigh bulk commodities in an automatic operation, but because of their design, fail to meet the current definition and the existing code. Proposed amendments to the ABWS Code could then be developed to address such systems.

Mr. Doug Musick (KS) noted that the current proposal is an initial attempt to update the current ABWS Code to address some newer automated weighing systems known to exist in the marketplace. He reported that some of these newer systems aren't able to comply with the existing ABWS Code, which provides indication of the need to update the current code. He agreed with OWM that more work was needed to further develop the proposal and requested additional input and assistance from those willing to provide it.

The Committee agreed that more work was needed to develop the item and assigned it a "Developing" status. The Committee recommends that the item's submitter review the 2015 SWMA S&T Annual Report for additional proposed revisions to the proposal by that region's S&T Committee.

2016 NCWM Annual Meeting
During its 2016 NCWM Annual Meeting open hearings, the Committee received an update on this item from Mr. Doug Musick (KS). Mr. Musick reported that work on the proposal is ongoing and he soon planned to submit an updated version of proposal to the Committee. He reiterated a comment made at the 2016 Interim Meeting that the proposal is an attempt to update the current ABWS Code to address some newer automated weighing systems known to exist in the marketplace today that aren't able to comply with the existing ABWS Code.

Mrs. Tina Butcher, (OWM) stated that OWM looks forward to being able to review an updated proposal to "modernize" the ABWS Code to more fully reflect the different types of systems currently in the marketplace. OWM noted in earlier comments that it recognizes the need for HB 44 to include requirements that address some automated weighing systems currently in the marketplace that, for one reason or another, fail to meet the definition of an ABWS or the application of the ABWS Code, yet, are being used to weigh bulk commodities in an automatic operation. When operated in an automatic mode, a number of these weighing systems <u>do not</u> consistently return to zero following discharge of a draft load. OWM believes this proposal is an attempt to address such systems.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA takes no position on this item at this time and looks forward to future analysis from OWM.

In consideration of the comments received, the Committee agreed to recommend this item move forward as Developing to allow for additional time to fully develop the proposal.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting open hearings, the Committee took comments on Agenda Item 3202-1.

The Item's submitter, Mr. Doug Musick (KS), submitted an amended version of the proposal following the 2016 NCWM Annual Meeting and commented that he felt the proposal was now fully developed and asked the Committee to move this item to a vote.

Mr. Rick Harshman (OWM) recommended that the item remain Developing. He questioned whether the proposed changes belonged in the ABWS code or possibly in an entirely separate code intended to address some automatic weighing systems known to exist in the marketplace for which the Scales Code, nor the ABWS Code, seem to fit their design and operational characteristics. He noted that the existing ABWS Code is intended to apply to systems that weigh only one commodity at a time in successive drafts. He asked, "if the proposed changes are intended to expand the existing code to include a wider range of systems, which additional systems is the submitter intending to address by expanding the ABWS Code?" Mr. Musick answered that it addresses weighing systems capable of operating without human intervention.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA takes no position on this item at this time and looks forward to more data.

Mr. Richard Suiter (Richard Suiter Consulting) urged the Committee to exercise caution in considering this item. He stated that he had concerns about striking the language for overfill sensors, and described how the sensors are not just for over capacity of the container. He noted that they are also for sensing when the height of the product reaches a point higher than the edge of the container, even though the container may not be at capacity. He advised that this redefining be done with careful consideration.

In consideration of the comments received, the Committee agreed that this item remain as Developing, to allow time to determine the impact of the changes on systems in this code.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA received one comment expressing that this item has merit and should remain a developing item. WWMA forwarded the item to NCWM and recommended Developing status.

The CWMA believes the submitter has developed this item to its full extent and it is ready for input from the NCWM S&T Committee and other stakeholders. The amended proposal is included as an attachment. CWMA recommends that this item be upgraded to Informational status.

The SWMA received no comments for this item. The Committee recommended that it remain in Developing status for continued progress by the submitter.

NEWMA forwarded this item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3204 AUTOMATIC WEIGHING SYSTEMS

3204-1 W T.N.2.1. General (See related items 3200-7, 3201-1, 3205-2, 3508-2, 3509-1 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each Code has a specific statement along the lines of:
>
> The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
> or
> The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.
>
> However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.
>
> | | | |
> |---|---|---|
> | 2.20 | Scales | Not specified & positive/negative |
> | 2.21 | Belt-Conveyor | Not specified |
> | 2.24 | AWS | positive/negative |
> | 2.25 | Weigh-in-Motion | Not specified |
> | 5.58 | MDMD | Not specified |
> | 5.59 | Electronic Livestock, Meat, etc. | Not specified |
>
> I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.
>
> Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gallons that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.
>
> It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.
>
> In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one

knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

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Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents. [Return to the Item]

3205 WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

3205-1 I A. Application. and Sections Throughout the Code to Address Commercial and Law Enforcement Applications

Background/Discussion:
The proposed requirements are based in part on requirements in OIML R 134, "Automatic instruments for weighing road vehicles in motion and measuring axle loads." Test data and experience at multiple test sites demonstrate this system can meet the performance requirements that are proposed.

The following represents the submitter's original proposal that earlier appeared as the Item Under Consideration for this item and was replaced following the 2016 NCWM Annual Meeting:

Amend NIST Handbook 44 Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening – Tentative Code as follows:

A.1. General. – This code applies to systems used to weigh vehicles~~,~~ while in motion~~.~~**.**

(a) For the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.
(b) For commercial legal for trade applications.
(c) For direct law enforcement applications.

A.2. Axle-Load Scales – The requirements for axle-load scales apply to such scales in official use for the enforcement of traffic and highway laws or for the collection of statistical information by government agencies and axle-load scales that meet the requirements of the Tentative Code for commercial use.

A.~~2~~ 3. The code does not apply to weighing systems intended **only** for the collection of statistical traffic data.

A.~~3~~ 4. Additional Code Requirements. – In addition to the requirements of this code, Weigh-In-Motion ~~Screening~~ Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5.

Examples: divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Maximum Value of Division Size. – ~~The value of the system division "d" for a Class A, Weight-In-Motion System shall not be greater than 50 kg (100 lb).~~

(a) The value of the system division "d" for a Class A, Weigh-In-Motion System shall not be greater than 50 kg (100 lb).
(b) The value of the system division for "d" for a Class B or III L, Weigh-In-Motion System shall not be greater than 10kg (20lb).

S.1.4. Value of Other Units of Measure.

S.1.4.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.4.2. Axle-Spacing (Length). – **If applicable** ~~T~~**t**he center-to-center distance between any two successive axles shall be measured in:

(a) feet and inches;

(b) feet and decimal submultiples of a foot; or
(c) meters and decimal submultiples of a meter.

S.1.4.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.5. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105% of the specified capacity of the load receiving element.

S.1.6. Identification of a Fault. – Fault conditions shall be presented to the operator in a clear and unambiguous means. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.
(b) The maximum number of vehicle axles as specified has been exceeded.
(c) A change in vehicle speed greater than that specified has been detected.

S.1.7. Recorded Representations.

S.1.7.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) transaction identification number;
(b) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in-motion);
(c) vehicle speed;
(d) number of axles;
(e) weight of each axle;
(f) **if applicable** identification and weight of axles groups;
(g) **if applicable** axle spacing;
(h) total vehicle weight;
(i) all fault conditions that occurred during the weighing of the vehicle;
(j) **if applicable** violations, as identified in paragraph S.2.1., that occurred during the weighing of the vehicle; and
(k) time & date.

S.1.8. Value of the Indicated and Recorded System Division. – The value of the system's division "(d)", as recorded, shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – **If applicable,** ~~T~~**t**he instrument shall be capable of accepting user entered violation parameters for the following items:

(a) single axle weight limit;
(b) axle group weight limit;
(c) gross vehicle weight limit; and
(d) bridge formula maximum.

The instrument shall display and or record violation conditions when these parameters have been exceeded.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. –An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with

independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load receiving element (or elements) is in use.

S.4. Design of Weighing Devices, Accuracy Class.

S.4.1. Designation of Accuracy. – ~~WIM Systems meeting the requirements of this code shall be designated as accuracy Class A.~~

(a) WIM Systems for screening and sorting, meeting the requirements of this code shall be designated as accuracy Class A.

(b) WIM Systems for commercial and law enforcement applications, meeting the requirements of this code shall be designated.

(1) Class III L for the dynamic gross vehicle weight calculations

(2) Class B for dynamic law enforcement applications

Note: This does not preclude ~~higher~~ **other** accuracy classes from being proposed and added to this Code in the future when it can be demonstrated that WIM systems grouped within those accuracy classes can achieve the ~~higher~~ level of accuracy specified for those devices.

S.5. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1. (e)), the system shall be marked with the following information:

(a) Accuracy Class;
(b) Value of the System Division "d";
(c) Operational Temperature Limits;
(d) Number of Instrumented Lanes (not required if only one lane is instrumented.);
(e) Minimum and Maximum Vehicle Speed;
(f) Maximum Number of Axles per Vehicle;
(g) Maximum Change in Vehicle Speed during Weighment; and
(h) Minimum and Maximum Load.

S.5.1. Location of Marking Information. – The marking information required in G-S.1. of the General Code and S.5. shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.5 shall be performed with a minimum of two test vehicles.

(a) The first test vehicle may be a two axle, six tire, single unit truck; that is, a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a ~~maximum~~ **minimum** Gross Vehicle Weight of 10,000 lbs.
(b) The second test vehicle shall be a ~~five-axle,~~ single trailer truck with a maximum Gross Vehicle Weight of
80,000 lbs.

Note: Consideration should be made for testing the systems using vehicles which are typical to the systems daily operation.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale before being used to conduct the dynamic tests.

N.1.1.2. Determining Reference Weights for Axle, Axle Groups and Gross Vehicle Weight. – The reference weights shall be the average weight value of a minimum of three static weighments of all single axle, axle groups and gross vehicle weight.

Note: The axles within an axle group **weighed only as an axle group** are not considered single axles.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded to 85 to 95% of their legal maximum Gross Vehicle Weight **or as typical in normal use.** The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

~~**N.1.3. Reference Scale.** – Each reference vehicle shall be weighed statically on a multiple platform vehicle scale comprised of three individual weighing/load receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances.~~

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a certified scale to determine the Gross Vehicle Weight. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior.

(a) For law enforcement applications the reference vehicle shall be weighed on a certified multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle.

Note: If the distance to an off-site reference scale will significantly impact the accuracy of the reference weights then the scale under test may be used as the reference scale.

(b) For commercial applications for the gross vehicle weight calculations only, the reference vehicle shall be weighed statically on either the same scale, a certified multiple platform vehicle scale or a single platform vehicle scale with sufficient length to accommodate single draft weighing of the reference vehicle

N.1.3.1. Location of a Reference Scale. – The location of the reference scale must be considered as vehicle weights
will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted within 20% **above the rated minimum and 20%** below **the rated maximum speed limits.**

N.1.5. Test Procedures. For law enforcement scales.

N.1.5.1. Static Test Procedures. - For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to Handbook 44 Class III L maintenance tolerances.

N.1.5.~~1~~2. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test there will be a minimum of 20 weight readings for each single axle, axle group and gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2.

N.1.5.~~2~~3. Vehicle Position Test. – During the conduct of the dynamic testing ensure that the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor, 5 runs with the vehicle on the right side along the width of the sensor, and 5 runs with the vehicle on the left side along the width of the sensor. Only gross vehicle weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3.

N.1.5.~~3~~4. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4.

N.1.6. Test Procedure for Commercial Gross Vehicle Weight Calculation Scales.

N.1.6.1. As-Used Test Procedures. – A weighing system shall be tested in a manner that represents the normal method of operation.

N.1.6.2. Static Test Procedures. - For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to Handbook 44 Class III L maintenance tolerances.

N.1.6.3. Dynamic Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 5 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test there will be a minimum of 5 weight readings for the gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on Handbook 44 Class III L maintenance tolerances.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of

the design principle used.

T.2. Tolerance Values for Accuracy Class A.

T.2.1. To Tests Involving Digital Indications or Representations – To the tolerances that would otherwise be applied in paragraphs T.2.2 and T.2.3, there shall be added an amount equal to one-half the value of the scale division to account for the uncertainty of digital rounding.

T.2.2. Tolerance Values for Dynamic Load Tests for Screening and Sorting devices. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2

Table T.2.2. – Tolerance for Accuracy Class A	
Load Description*	**Tolerance as a Percentage of Applied Test Load**
Axle Load	±20%
Axle Group Load	±15%
Gross Vehicle Weight	±10%
* No more than 5% of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.	

T.2.3. Tolerance Value for Vehicle Position Test. – The tolerance value applied to each gross vehicle weighment is ±10% of the applied test load.

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 meter (0.5 feet).

T.3. Tolerance Values for Dynamic Weighing Systems Used Commercially and for Direct Law Enforcement. -The tolerance values applicable during dynamic load testing are as specified in Table T.2.2

Table T.3. – Tolerance for Commercial and Law Enforcement Dynamic Scales.	
Load Description	**Tolerance as a Percentage of Applied Test Load**
Axle Load	**±0.5%**
Axle Group Load	**±1%**
Gross Vehicle Weight	**Class III L Maintenance Tolerance**

T.3.4. Influence Factors. – The following factors are applicable to tests conducted under controlled conditions only.

T.3.4.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature

unless a limited operating temperature range is specified by the manufacturer.

T.45. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed the tolerance value as stated in Table T.2.2. **or Table T.3 as applicable.**

UR. USER REQUIREMENTS

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division and minimum capacity.

UR.1.1. General

The typical class or type of device for particular weighing applications is shown in Table 1. Typical Class or Type of Device for Weighing Applications.

Table 1.

Typical Class or type of Device for Weighing Applications

Class	Weighing Application
A	Screening and sorting of vehicles based on axle, axle group and gross vehicle weight.
B	**Dynamic law enforcement axle, axle group and gross vehicle weight.**
III L	**Commercial and direct law enforcement**
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.
On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.2.4. Axle-Load Scales Approaches. – At each end of an axle-load scale there shall be a straight, paved, and level approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles on the approaches throughout the weighing process.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

2016 NCWM Interim Meeting:
During the 2016 NCWM Interim Meeting, Mr. John Lawn (Rinstrum, Inc.) presented a short slide presentation on a slow speed WIM system that Rinstrum, Inc., manufactures. A copy of the slides from his presentation has been inserted into Appendix B of this report. Mr. Lawn explained that he had originally hoped the proposal could be considered for vote in 2016, but had decided to request it move forward as Developing in 2016 to allow time for Rinstrum to address some of the concerns that had been raised through the review process and to better familiarize the weights and measures community with the equipment. He also indicated that he understood the need for Rinstrum to provide data in support of their claim that the equipment is capable of conforming to the tolerances specified in the proposal. Rinstrum's plan going forward is to amend the current proposal to address all the issues and have a new proposal ready in time that it can be considered for vote in 2017.

Mrs. Tina Butcher (OWM) noted that the adoption of this proposal would, for the first time ever, make it permissible for WIM vehicle systems installed in the U.S. to be used not only for direct law-enforcement applications, but also for commercial applications. She further explained that while OWM encourages the expansion of the code to recognize such applications, the proposal needs to be thoroughly vetted by all the different parties affected by the changes being proposed, including (but not necessarily limited to):

- truck weight enforcement officials;
- representatives from the judicial system;
- WIM equipment manufacturers;
- weights and measures officials;
- FHWA and other transportation officials; and
- members of the trucking industry.

The submitter and others have acknowledged the proposal needs a considerable amount of additional development before it is ready to move forward for vote. Mrs. Butcher recommended the proposal remain in a Developing status until such time that the WIM WG or other representative group has reviewed and considered its merits.

Mrs. Butcher further reported that in OWM's analysis of this item, there were several areas identified as needing additional development to include:

- The procedures developed by the WIM WG for establishing reference test loads for testing WIM systems used in law enforcement screening may not provide the level of accuracy needed (i.e., combined error and uncertainty less than one-third applicable tolerance) for testing commercial and law-enforcement WIMs given the more stringent tolerances proposed for these applications.
- Studies have shown that axle and tandem axle weights fluctuate depending on the positon of a truck on a scale. How will this be addressed in the procedures for establishing the reference test loads for testing axle and axle-groups?
- Under what conditions are officials willing to accept a single tolerance (i.e. Class IIIL Maintenance tolerance) for commercial applications?
- Why is there not an acceptance tolerance proposed? Is it because the amount of error in the WIM system is not expected to change as a result of routine, continued use?
- If a single tolerance is accepted, will this be limited to certain applications?

She also noted that as the proposal is further developed, additional changes to format and structure of the code may be needed to clearly delineate requirements for commercial WIM applications from those used for law-enforcement.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes the inclusion of these changes in the Weigh-In-Motion for Vehicle Enforcement Screening Code. The SMA supports the idea identified, but feels additional clarification and development is required.

A couple of regulatory officials commented in support of maintaining the Developing status of the proposal.

The Committee agreed with the submitter's request and recommended the item move forward as Developing.

2016 NCWM Annual Meeting:
During the Committee's open hearings at the 2016 NCWM Annual Meeting, Mr. John Lawn (Rinstrum, Inc.) reported that the current proposal is no longer being considered and that an NCWM Task Group has formed to assist in the further development of a proposal to replace it. He provided a brief update on some of the discussions that had taken place within the Task Group, which had met a day earlier. He stated that the Task Group had already agreed that the proposal needed to be changed to separate the requirements for WIM systems used in commercial application from those used for direct enforcement. He requested that the Committee replace the proposal included in the Item Under Consideration with a synopsis, which he offered to draft and provide to the Committee given that the current proposal was no longer being considered.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, stated that the SMA takes no position on this item at this time and looks forward to recommendations from the newly formed Weigh-In-Motion Task Group.

In consideration of Mr. Lawn's request to do so, the Committee agreed to replace the proposal in the Item Under Consideration with a synopsis to be developed by him. The Committee also changed the status of the item to "Information" because an NCWM Task Group, under the direction of the Committee, is now assisting in the development of a proposal. This change in status is an indication that the Committee has taken responsibility for the additional development of this item.

2017 NCWM Interim Meeting:
An update was given at the 2017 NCWM Interim Meeting on this developing item by Mr. Alan Walker (Florida), Chairman of NCWM's Weigh-In-Motion Task Group (TG) and Mr. John Lawn, (Rinstrum, Inc.). Mr. Walker reported that the TG is currently reviewing the different paragraphs in the Scales Code of HB 44 to determine needed amendments to address WIM vehicle scale systems. That review started with the "Application" section of the code and has now progressed to the "Notes" section of the code. Mr. Walker noted that there are few weights and measures regulatory officials participating on the TG and encouraged anyone who might be interested in wanting to participate, to please contact him. Mr. Lawn provided an update on some recent testing of a Rinstrum WIM vehicle scale system by the State of Illinois and witnessed by some members of the TG. Mr. Lawn indicated that the results of this testing proved inclusive due to poor weather conditions on the day of the test.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA takes no position on this item at this time and looks forward to recommendations from the Weigh-In-Motion Task Group.

Mr. Rick Harshman (OWM) complimented the TG on its progress, while noting too, that OWM believes a significant amount of work still remains to be done (particularly in the area of defining appropriate test procedures) before the proposal will be ready for consideration as a voting item.

The Committee agreed to maintain an Informational status on this item to allow the TG time to complete its work.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA received one comment that was concerned with N.1.3. for the reference scale. WWMA recommended that the item be informational as it is being worked on by a NCWM task group and looks forward to updates.

The CWMA supported the item and looks forward to the changes proposed by the national work group. CWMA recommends that this be an Informational item.

The SWMA heard comment from Ms. Tina Butcher (OWM) that there were a number of things that need to be resolved still and this item should remain as a developing item until the workgroup has time to make a proposal. Mr. Tim Chesser (AR) stated that the item is closer to getting this system to meet the requirements of the existing Scale Code, but not the recently passed Weigh-in-Motion Code that applies to law enforcement scales. Mr. Lou Straub (Fairbanks Scales) stated that as a member of this workgroup they have had multiple conference calls already and had another one scheduled for later October 2016 and that by January 2017 the workgroup should have something to present although it may not be ready for a vote in July. Mr. Straub also reiterated Mr. Chesser's comments noting that this is more likely to be a separate code rather than a modification of the existing Weigh-in-Motion Code. The SWMA recommended this item remain in Developing status for continued progress by the submitter. The SWMA would also like to see a proposal for consideration at the Interim Meeting in January.

NEWMA recommended that this item remain in Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3205-2 W T.1.1. Design (See related items 3200-7, 3201-1, 3204-1, 3508-2, 3509-1 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each Code has a specific statement along the lines of:
>
> The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
> or
> The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.
>
> However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
2.21	Belt-Conveyor	Not specified
2.24	AWS	positive/negative
2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.

Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gallons that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-7 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents. [Return to the Item]

3300 LIQUID MEASURING DEVICES

3300-1 V S.2.1. Vapor Elimination (See related items 3301-1, 3305-1, 3306-1 and 3307-1)

Background/Discussion:
The proposed changes would ensure consistency across the various measuring device codes in NIST Handbook 44. This would help ensure more uniform interpretation of the requirements and facilitate application by officials and industry.

The proposed changes will align other codes with the following changes that were made to the LPG code at the 2016 NCWM Annual Meeting.

S.2.1. Vapor Elimination. –

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 20XX)

The proposed changes make the requirement less design-specific and more focused on ensuring that the means for eliminating air or vapor are effective, including that the vent lines not be susceptible to restriction. The proposed changes also clarify that the provision for vapor elimination must be automatic in nature in order to be considered effective.

NIST OWM in its analysis of the 2016 S&T Agenda Item referenced above suggested that a similar change be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such an item on its agenda in the 2016-2017 NCWM cycle.

Note that the Mass Flow Meters Code states “means to prevent the measurement of vapor and air” while other codes state “means to prevent the passage of vapor and air through the meter,” but such distinction is probably justified. Consequently, no modifications are proposed to align this language with other codes.

2017 NCWM Interim Meeting
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 together and took comments on these items simultaneously because it considered these items related.

During open hearings, the Committee received several comments in support of the group of items from industry with one minor change requested to paragraph S.2.1. Vapor Elimination in “Item under Consideration” for Agenda Item 3300-1. It was suggested that the word “device” in part (a) of the paragraph be replaced with the word “system” that it read:

(a) A liquid-measuring ~~**device**~~ **system** shall be equipped with **an effective,** ~~**a vapor or air eliminator or other**~~ automatic means to prevent the passage of vapor and air through the meter.

Others speaking in support of this group of items, also agreed with this change.

Mrs. Tina Butcher (OWM) stated that Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 Vapor Elimination were submitted jointly by Liquid Controls and NIST OWM based on a suggestion made to the S&T Committee at the 2016 NCWM Annual Meeting. At that meeting, changes were made to the LPG & NH3 Code to clarify that vapor elimination means must be effective and automatic in nature and also to update the language relative to ensuring that the materials used for vent lines from the vapor/air eliminator prevent the lines from being restricted. When these changes were adopted, a suggestion was made to modify other measuring codes to align the language in those codes with that adopted in the LPG & NH3 code. OWM believes these changes are appropriate and provide better alignment and consistency across the measuring codes. OWM concurs with the SWMA's suggestion to change the term "device" to "system" in Item 3300-1 (SWMA's reference Agenda Item New 13), believing that this broad reference would be more appropriate and less limiting. OWM asks that this change be made to the proposed language presented in the Item Under Consideration for 3300-1.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) commented that he would prefer to see the language the same in all the codes and that he would be willing to support the items fully if this were the case. It was suggested that the Committee develop additional draft proposals to align the vapor/air elimination paragraphs in all the measuring codes. Upon hearing this suggestion, the NIST Technical Advisor questioned whether those making such a suggestion might do this work and present completed drafts to the Committee for consideration. Committee members agreed that those suggesting and/or supporting this action should complete this work rather than the Committee. Mrs. Butcher and Mr. Dmitri Karimov (Liquid Controls) agreed to review the vapor/air elimination paragraphs in all the measuring codes and draft consistent language to propose for all the codes, which they completed and provided to the Committee the next morning. In addition to proposing changes to the vapor/air elimination paragraph(s) in Sections 3.30, 3.31, 3.35, 3.36, and 3.37 of HB 44, for which there were already current proposals on the Committee's agenda, there were also proposed changes to align the vapor/air elimination paragraph(s) in Sections 3.32, 3.33, 3.34, and 3.38, which were new and not a part of the Committee's current agenda.

During the Committee's work session, all of the draft proposals were reviewed and members of the Committee agreed that all should be presented for vote at the upcoming annual meeting. The Committee believed it was within its discretion to create new agenda items, which were needed for the draft changes being proposed in the vapor/air elimination paragraph(s) of Sections 3.32, 3.32, 3.34, and 3.38., because it considered the proposed changes simply a continuation of the effort to align the language in the different measuring code sections of HB 44. Consequently, the Committee agreed to create a new agenda item to be included in NCWM Publication 16 for each of these Sections and Dr. Matthew Curran (Florida), S&T Committee Chairman, announced to the NCWM membership at the 2017 NCWM Interim Meeting, the Committee's plans to add new voting items to its agenda to harmonize the vapor/air elimination language in all the codes.

Shortly following the 2017 Interim Meeting, the NIST Technical Advisor drafted a document for Committee review that included the five current items on the Committee's agenda and four new items that were added. The text of the four new items was highlighted in yellow to differentiate the new items from those already appearing on the Committee's agenda. Each of the new items appearing in this document also included a draft paragraph specifying that the item was new and a brief summary of why the item was being added by the Committee. The document was distributed to members of the Committee to seek approval of the text shown in the Item under Consideration portion of each item. Mr. Don Onwiler (NCWM) was copied to make aware the Committee's intention of adding the new items to its agenda. Upon reviewing the document, Mr. Onwiler made it known to the Committee that he was concerned whether the NCWM bylaws would allow a standing committee to add new items to its agenda at the NCWM Interim Meeting. Mr. Onwiler agreed to ask the NCWM Board of Directors (BOD) for an opinion on the matter and subsequently hosted a teleconference involving members of the NCWM BOD, Dr. Curran, Mr. Rick Harshman (NIST Technical Advisor to the S&T Committee), additional staff of OWM, and others. During the teleconference, Dr. Curran was asked to provide a brief summary of the Committee's discussion at the Interim Meeting leading to the Committee's desire to add these new items to its agenda. Members of the BOD, upon hearing Mr. Curran's explanation of the discussion and rationale, while they understood the intent they expressed concern to adding the items to the agenda as they believed such action could violate the current bylaws of the NCWM. Since these items did not fall under the "priority" classification as agreed upon by Dr. Curran and the

Committee, which would allow for the addition of such items, there was mutual agreement to remove these new items from this year's agenda and allow them to be submitted in the fall.

Members of the Committee were subsequently made aware of the BOD's concern for adding the new items and asked whether or not the five original items appearing on the Committee's current Interim Meeting agenda, as amended by the Committee during the 2017 NCWM Interim Meeting, should be presented for vote at the upcoming NCWM Annual Meeting or held back until all proposals could be presented for vote at the same time. Members of the Committee agreed to present the five current agenda items (as shown in Item under Consideration for each item) for vote at the upcoming 2017 NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA considered items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 at the same time. NIST OWM will update language adopted at the 2016 NCWM Annual Meeting to these additional devices. The WWMA considered these items developed and forwarded them to NCWM, recommending Voting status.

The CWMA recognized the value of aligning the measuring device codes and forwarded this item to NCWM, recommending Voting status.

The SWMA batched items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 together and heard comments for all items at the same time. Mr. Gordon Johnson (Gilbarco) stated that his comments applied only to Item 3300-1. Specifically, Mr. Johnson stated that he would suggest the word "device" in S.2.1.a be changed to "system. He added that this was necessary because it does not reflect what industry has been doing. Mr. Johnson further clarified that the dispenser doesn't need the air eliminator, rather the system does as air elimination doesn't actually occur in the dispenser itself. Ms. Tina Butcher (OWM) stated she wouldn't be opposed to Mr. Johnson's suggestions. Ms. Butcher added that we may also need to take a broader look across the codes for this type of unintended consequence. Mr. Tim Chesser (AR) asked if at some point this type of issue should be resolved through language in the General Code. The SWMA forwarded this item to NCWM and recommended changing "device" to "system" in S.2.1. as suggested during the open hearings. With this modification, the SMWA recommended Voting status for this item.

NEWMA recommended that adding the word "system" following "a liquid measuring device". NEWMA forwarded the item to NCWM and recommended Voting status with that change.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3300-2 V UR.3.4. Printed Ticket

Background/Discussion:
The consumer as well as the weights and measures official would be able to verify that all transaction information corresponds accurately at locations with multiple dispensers on site. If no pump designation is on the receipt it hinders the consumer's ability to know that they were given the correct receipt for the transaction. Similarly, a pump designation on the receipt will asset weights and measures in verifying correct communication between devices as well as follow up as needed in case of a consumer complaint.

The submitter recognizes that software updates would be required for those establishments that do not already meet this proposed requirement.

2017 NCWM Interim Meeting:
During the 2017 NCWM Interim Meeting S&T Committee's open hearings, Mrs. Tina Butcher (OWM) noted that paragraph UR.3.4. Printed Ticket was originally added to NBS Handbook 44 in 1967 at the request of industry to

address technology limitations which would have made it impractical from a cost perspective to print all three values (i.e., total price, total volume of delivery, and the price per liter or gallon). She said one question that might be considered given today's technology is whether the provision to allow values to be written in hand script is still appropriate or if a system that is capable of providing a printed ticket should be required to print all of the values. She noted too that this item didn't propose corresponding amendments to paragraphs S.1.6.7. or S.1.6.8. To this point, she indicated that the Committee may want to consider recommending changes to those two requirements to align the requirements for printed receipts. As a final comment she said that should the Committee decide to recommend paragraph UR.3.4. be changed, it may want to reorganize the paragraph so it is clearer and intended only to apply to devices that issue a printed ticket. She provided the Committee a revised version of the paragraph, which had been developed by members of OWM's Legal Metrology Devices Program for the Committee to consider.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA reported that the MMA supported the NIST observations.

In discussing this item during the Committee's work session, members of the Committee agreed that the manner in which paragraph UR.3.4. is currently structured needs improvement. Some members of the Committee described the paragraph as being "messy" and difficult to follow. The Committee reviewed the revised version of the paragraph developed by members of OWM's LMDP and it was agreed that, although still not ideal, it was an improvement over the version that was included under this item. Consequently, members of the Committee agreed to replace the submitter's version of the proposal with the revised version offered by NIST and shown in Item under Consideration and present this item for vote at the upcoming NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA fully supported this item and believes this will be beneficial when investigating complaints. CWMA forwarded the item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3300-3 W Recognized the Use of Digital Density Meters

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

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Background/Discussion:
Current test procedures are slow and awkward due to the need of using borosilicate glassware for package checking. Digital density meters are fast, use small samples size (2 ml) and have built in thermometers.

When conducting volumetric testing of meters used for dispensing viscous fluids such as motor oil, DEF, antifreeze, syrups, etc., air becomes entrapped in the fluid and clings to the sides of the prover which adversely affect the results of the test. In order to conduct gravimetric tests, it is necessary to determine the density of the product. Digital density meters are fast and accurate in comparison with recognized gravimetric testing procedures using flasks and thermometers. There is no need to "wet down" volumetric flasks before each measurement. Most non-food products

may be recovered without contamination. Only a small sample size (2 ml) of the product is needed for testing. Using digital density meters equipped with built-in API density tables will not require the cooling samples to 60 F. There is no need for a partial immersion thermometer or volumetric flasks.

Well established ASTM and other international standard test methods are available with precision statements.

2016 NCWM Interim Meeting:
Mrs. Tina Butcher (OWM) and Mr. Ross Anderson (NY-Retired) both stated they supported the concept, but questioned whether the use of density meters needed to be addressed in HB 44. They suggested a more appropriate place might be in an EPO or other similar document. Mr. Michael Keilty (Endress + Hauser Flowtec) recommended keeping this in a "Developmental" status because the direction of the item was a little unclear. Mr. Dmitri Karimov (Liquid Controls) recommended this item be withdrawn. Based on the comments received, the Committee agreed to assign the item a "Developing" status.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Mr. Ron Hayes (Missouri) provided an update on the progress to develop this item and requested it remain in a Developing status to allow time to complete this work.

Mrs. Tina Butcher (OWM) reiterated many of the comments provided by OWM at the 2016 NCWM Interim Meeting. She stated that OWM supports the concept of using digital density meters in testing of metering systems and looks forward to the further development of this item. An accurate determination of product density is essential when conducting gravimetric tests and having the facility to make this determination might encourage inspection and testing of meters that dispense products with characteristics (e.g., viscosity, corrosiveness, etc.) that may not lend themselves to volumetric testing methods.

OWM recognizes that the item is still under development and suggests that other codes which currently reference gravimetric test procedures in HB 44 be considered as a template. Since the "Notes" section of the LMD Code currently makes reference to test drafts in volumetric units these paragraphs may need to be reviewed for possible revision. In addition, the Fundamental Considerations should be considered in defining the suitability criteria of any density meter used in testing. It may be that the NIST EPOs, training materials, or other guidance documents might be more appropriate place(s) to specify details regarding the selection and use of this equipment and to provide details on its specifications. An additional question might be whether or not there needs to be additional criteria in laboratory metrology documents such as the NIST 105 Series handbooks or in the NIST Handbook 133 procedures for gravimetric testing.

Mrs. Butcher also reported that OWM's Laboratory Metrology Program had previously conducted some testing of portable density meters in 2006. The results from that testing showed that the units don't work very well for liquids that are likely to produce air bubbles, e.g. oils or any product with carbonation. At the time, OWM was considering their use in determining density for package checking and found that the accuracy is suspect with products that form bubbles. Further, measurements are inaccurate when there are bubbles present in the oscillating tube and repeat repeatability suffers when some samples have bubbles and others do not.

In consideration of the comments received, the Committee agreed to maintain the item's Developing status.

2017 NCWM Interim Meeting
At the Committee's 2017 NCWM Interim meeting open hearings, Mr. Ron Hayes (MO), submitter of the item, reported that he is still actively working to further develop the proposal. He noted the existence of a portable density meter that's currently available on the market, which contains a built-in camera aimed at a vibrating tube inside of the meter. When a photo is taken, it captures the amount of bubbles suspended in the product in which the density is being measured and records the time of the photo. He indicated the device is *not* inexpensive.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), stated that too he has been studying density meters, although his focus has been on high-end density meters.

Mrs. Tina Butcher (OWM) reported that OWM supports the concept of using digital density meters in testing metering systems and looks forward to the further development of this item. She suggested the Fundamental Considerations of HB 44 be considered in defining the suitability criteria of any density meter used in testing. She also suggested it may be that the NIST EPOs, training materials, or other guidance documents might be more appropriate place(s) to specify details regarding the selection and use of this equipment and to provide details on its specifications.

During the Committee's work session, it was noted that this item has been on the Committee's agenda since 2016 and yet, still lacked the existence of a definitive proposal. There was a motion initiated by a Committee member recommending the item be withdrawn with the understanding that such action by the Committee would not prevent the submitter from continuing efforts to develop a more definitive proposal and submitting it later as a new proposal should he want to. Given the lack of progress to develop this item, the Committee agreed to recommend it be withdrawn from its agenda.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA did not receive comments on this developing item.

The CWMA believed this item has merit but does not belong in Handbook 44. It should be included in other documents such as Handbook 112 and 105. CWMA recommends that this item be withdrawn.

The SWMA received no comments for this item and looks forward to the development of this item by the submitter. The SWMA recommended that this item remain in Developing status.

NEWMA recommended that this item remain Developing.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3301 VEHICLE-TANK METERS

3301-1 V S.2.1. Vapor Elimination (See related items 3300-1, 3305-1, 3306-1 and 3307-1)

Background/Discussion:
The proposed changes would ensure consistency across the various measuring device codes in NIST Handbook 44. This would help ensure more uniform interpretation of the requirements and facilitate application by officials and industry.

The proposed changes will align other codes with the following changes that were made to the LPG code at the 2016 NCWM Annual Meeting.

S.2.1. Vapor Elimination. –

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 20XX)

The proposed changes make the requirement less design-specific and more focused on ensuring that the means for eliminating air or vapor are effective, including that the vent lines not be susceptible to restriction. The proposed changes also clarify that the provision for vapor elimination must be automatic in nature in order to be considered effective.

NIST OWM in its analysis of the 2016 S&T Agenda Item referenced above suggested that a similar change be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such an item on its agenda in the 2016-2017 NCWM cycle.

Note that the Mass Flow Meters Code states "means to prevent the measurement of vapor and air" while other codes state "means to prevent the passage of vapor and air through the meter," but such distinction is probably justified. Consequently, no modifications are proposed to align this language with other codes.

2017 NCWM Interim Meeting
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3300-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA considered items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 at the same time. NIST OWM will update language adopted at the 2016 NCWM Annual Meeting to these additional devices. The WWMA considered these items developed and forwarded them to NCWM, recommending Voting status.

The CWMA recognized the value of aligning the measuring device codes and forwarded this item to NCWM, recommending Voting status.

The SWMA batched items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1together and heard comments for all items at the same time. The only comments received were for item. 3300-1. See that item for details. The SWMA forwarded this item to NCWM and recommended Voting status.

NEWMA Forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3301-2 D S.3.7. Manifold Hose Flush System

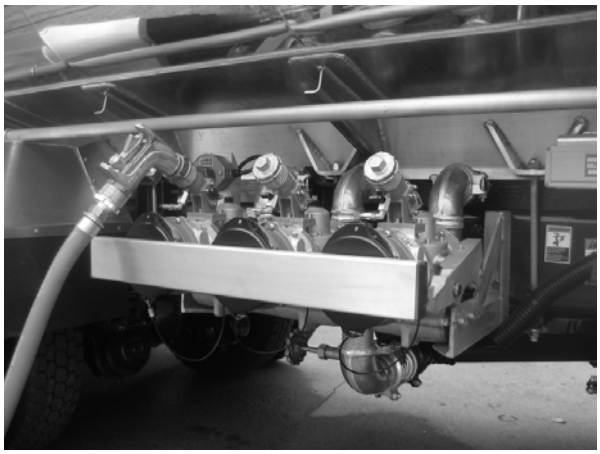
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mike Sikula
New York Department of Agriculture
518-457-3146
Mike.sikula@agriculture.ny.gov

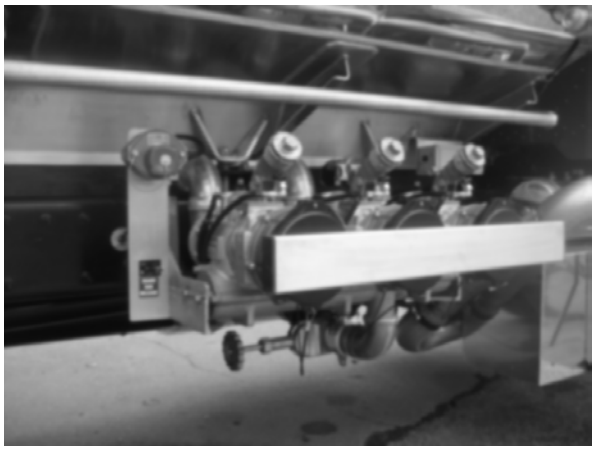
Background/Discussion:
Hose flush systems allow drivers to flush product where a truck is set-up to deliver multiple products through a single meter and hose. The system is particularly popular because it allows drivers to flush product without having to climb up on top of the truck which is a common practice in the industry but can also be dangerous. These systems are considered a significant safety advancement, however, without safeguards in place could also be used to facilitate fraud.

These systems are being used country wide and there is no uniformity in what is and what is not acceptable by W&M. Some states have developed their own policies for acceptance but this has led to problems when trucks have been moved from one state to another. Some states are considering prohibiting these systems citing facilitation of fraud, however, they are also concerned that such prohibition may lead to drivers being unnecessarily injured or even killed. We want to do our job but we also want drivers to be able to do their jobs in the safest way possible.

These systems make returning product after W&M testing very easy. These systems are also very good for preventing contamination of product.



3 Compartment Manifold with Nozzle



3 Compartment Manifold

2016 NCWM Interim Meeting:
The Committee heard comments on this item from Mr. Mike Sikula (New York), Mr. Hal Prince (Florida), Mr. Steve Giguere (Maine), Mr. John McGuire (New Jersey), Mr. Charlie Carroll (Massachusetts), Mrs. Tina Butcher (OWM), Mr. Dmitri Karimov (Liquid Controls), and from Mr. Dick Suiter (Richard Suiter Consulting). Mr. Sikula indicated that some newer trucks were designed with manifold hose flush systems that needed controls to prevent fraud, and also pointed out that this was a nationwide issue not just a New York issue.

Mrs. Butcher mentioned a need to provide additional safeguards; mark direction of flow on inlet and outlet valves; and add user requirements on when and how these systems should be used. Mr. Karimov advocated the addition of a second meter. Mr. Carroll said manifold flush systems should not be allowed.

There was general consensus in the comments heard that the hose flush back systems have arisen from a desire to minimize safety concerns with the delivery drivers having to climb up on top of trucks to flush hoses; however, these systems could enable fraud as fuel could be diverted after the meter and documentation of the flushing is typically not maintained. The Committee believes this item has merit and needs further development and is interested in hearing from other states and manufacturers on this issue.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee received an update on this item from its submitter, Mr. Mike Sikula (NY). Mr. Sikula reported that manifold hose flush systems continue to be an issue in NY and that work on this item is ongoing.

Mrs. Tina Butcher (OWM) reiterated a number of the comments and recommendation OWM had presented at the 2016 NCWM Interim Meeting. The following is a shortened summary of the comments and recommendations she provided:

- There are undoubtedly safety and time advantages to being able to flush product from a hose using this system, there are also obvious concerns about the possibility of facilitation of fraud;
- It is presumably very easy to pump metered product back into the tank with this system and is much less obvious and less difficult than climbing to the top of the truck with a charged hose and returning it through the hatches. Particularly in an environment where customers are often not present during the delivery, this creates serious concerns about its potential misuse and the ease with which that misuse can occur.
- If manifold hose flush systems are permitted, it would be essential to have certain safeguards in place to help prevent misuse; yet still allow the operator to benefit from improved safety and ease of use offered by the system.
- The system does not appear to violate the diversion of product requirements outlined in VTM Code paragraph S.3.1. Diversion of Measured Liquid since the manifold equipment isn't part of the discharge line or piping connected to the metering system.
- The process of diverting already measured product through the use of the system would not be obvious to an untrained observer and is much more easily accomplished than having to climb to the top of a truck and flushing product back into one of the storage compartments.

The following key points and questions were also provided by OWM in written comments and recommendations to the Committee for it to consider in its assessment of this proposal:

- An argument in favor of such a system is that it provides a safer alternative for the operator to use than climbing to the top of the truck when flushing product back into the storage tank. Additionally, it may encourage proper flushing and help reduce operators taking shortcuts; this could prevent product contamination in a customer's tank and the potential safety hazards associated with such contamination. However, safeguards in the form of automatic features as well as user requirements would be essential to discourage misuse.
- The inlet valves for the system need to be clearly and permanently marked to indicate they are for use in "flushing" so that their purpose is clear to an observer.
- The meter and printer are presumably in operation during this procedure, which also means that, if the system were misused, the operation could take place at the beginning or end of a customer's delivery, thus diverting measured product. OWM previously read information on such a system which indicated that there are safeguards to help prevent cross contamination of product. This suggests some degree of

sophistication in the software, suggesting that it may be possible to incorporate other safeguards to help prevent misuse of the system. Consequently, OWM believes that displayed and recorded indications of quantity should be automatically inhibited whenever the flush system is in operation. Alternatively, or perhaps in addition, a requirement should be included to require clear indications that the indicated and recorded quantity and other associated information are not to be used for commercial purposes.

- An added measure of protection would be provided if, while in the "flush" mode, there is a clear indication that the device is not in normal operation.

- An accompanying user requirement clarifying that the flush system is not to be used during a commercial transaction would also help limit its use. The operator should have to reset the system following the flush procedure prior to beginning a commercial transaction. Is additional language needed to clarify this?

- OWM believes an associated user requirement needs to be included to restrict the use of such systems and to help ensure their proper use. A suggestion is provided at the end of OWM's comments on this item, but further refinement and input is needed.

- Is using the same meter to dispense products that are significantly different enough to create the need to routinely recirculate product a suitable use of the equipment? Using different meters to avoid the contamination and safety issue altogether would eliminate the need for such a system. What is the cost of a second meter relative to the cost (and fraud risk) of this manifold system? Some have reported that the number of companies running different products (e.g., gas and home heating oil) through the same meter has diminished because of safety concerns, but we still hear about such scenarios when we conduct training schools.

- Are these systems installed on metering systems that are *not* equipped with the capability to measure different products with different accuracy settings (e.g., product codes with associated calibration factors)? If a meter (such as a mechanical meter with mechanical indicator) without such features is used for multiple different products, presumably there are no provisions to allow for different accuracy settings. A flush system might encourage this type of scenario and consideration might need to be given to limiting the system to only systems with multiple product/calibration factor capability.

- How will the owner/operator track metered product for use in tax reporting? Will the indications be suppressed to ensure that it is not recorded as delivered product? Or is a printed or electronic record provided of recirculated product or perhaps the totalizer readings could be used?

- Is there any control or interlock that would prevent flushing the hose into the manifold for the ***same*** product selected for delivery? For example, if the operator last delivered gasoline and has selected fuel oil for the current transaction, should the system prevent the operator from flushing the hose back into the same product type (for which there is presumably no need to flush the hose)? This might provide an added safeguard that would prevent someone from "recirculating" the same product rather than "flushing" a different type of product. At minimum, this should be a user requirement; it would be best if it could also be required in the flush system design.

- The visible view ports provide the operator with a means to visually observe when the product has flushed from the hose. Will this be a feature on all such systems? Is there any reason to require such viewing ports?

- In LMD Code paragraph S.3.1. Diversion of Measured Liquid, a provision was added to allow purging or draining, but only when the system is not in operation. In reviewing the history for the LMD Code paragraph, it appears that such provisions were not added to that paragraph in the VTM Code, but not necessarily because of greater concerns over fraud in the VTM applications. Instead, it was likely that the question just hadn't come up for those applications. The provision in the LMD Code provides an example in which weights and measures officials have allowed a feature or operation that is deemed necessary to

normal operation (just as one could argue line purging to prevent cross contamination is necessary), but which could otherwise facilitate fraud. In other words, if the concern over fraud is great enough, then additional provisions may need to be added to the code or required via interpretation of G-S.2. to minimize the possibility through the use of a "necessary" feature before that feature is allowed. Thus, the addition of the proposed paragraph to the VTM Code would acknowledge the use of the feature, but provide additional safeguards for its proper use.

- An additional aspect of the LMD Code Paragraph S.3.1. Diversion of Measured Liquid is that it includes requirements prohibiting diversion of measured product from the measuring chamber or its discharge line. However, outlets for purging or draining the system are permitted under limited, specific circumstances. In recognition of the importance of ensuring that product is not recirculated during a commercial transaction, a provision was included in the LMD Code requirement that inhibits meter indications during the process of recirculating:

  > Effective automatic means shall be provided to prevent passage of liquid through any such outlet during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the outlet is in operation.

  OWM suggests that similar language be included in the proposed paragraph such that the indications and any recorded representations are inhibited during the recirculation process. Alternatively, but less desirable, would be that the displayed and printed quantity indications be unusable or clearly designated as such.

- The statement “inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use” might be better included as a user requirement.

- Should the requirement include provisions for a programmable limit on the quantity of fuel that can be flushed based on the volume of the hose for an individual metering system?

- The CWMA, SWMA, and WWMA have not yet reviewed this item; it will be beneficial to hear input from officials and industry in those regions to ensure that key technical issues and concerns have been addressed.

Based on these observations and comments, OWM recommends the following alternative version of the original proposal:

S.3.7. Manifold Hose Flush System. – A hose flush system that may be used for purging the measuring system. Such a system shall only be installed in the manifold when multiple products are dispensed through a single meter and hose, provided all of the following conditions are met:

(a) The discharge hose remains of the wet hose type.
(b) The inlet valves for the system are conspicuously located above the bottom framework of the truck.
(c) The inlet valves for the system must be clearly marked to indicate they are used for “flushing” product.
(d) The flush system is not to be operational during a commercial transaction.
~~(e) The inlet valves for the system are not connected to any hose or piping (dust covers are permitted) when not in use.~~
(f) The direction of product flow is clearly and automatically indicated during operation of the measuring and/or the flush systems.
(g) Effective automatic means shall be provided to prevent passage of liquid through any such flush system during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the flush system is in operation.
(h) A clear indication is provided, both in the quantity indications and any associated recorded representations, stating that the device is in a “flushing mode” and “not for commercial use” when the flush system is in operation.

(i) A recorded representation of each flush is maintained for inspection.

Additionally, OWM recommends the inclusion of a proposed new "User Requirement" to help ensure proper application and use of such flush systems. The following is offered for consideration:

> **UR.2.6. Manifold Hose Flush System Use. -** A manifold flush system or similar system designed to assist in flushing product between deliveries is not to be used or operational during a commercial transaction. The inlet valves for the system are not to be connected to any hose or piping (dust covers are permitted) when not in use. When the flushing system is in operation, the discharge hose is only to be connected to the port for the product type being flushed from the discharge line. Following the flushing process, indications and recording elements must be reset to zero prior to beginning a commercial delivery. A manifold flush system is not to be used on a metering system that is not equipped with the capability to accept separate calibration factors for different product types.
> (Added 2016)

In consideration of the comments received, the Committee agreed to maintain the Developing status of the item to allow additional time for its further development

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting S & T Committee open hearings, Mrs. Tina Butcher (OWM) reported that OWM believes additional work is needed to develop this proposal. Mrs. Butcher reiterated many of the comments OWM provided on this item at the 2016 NCWM Interim Meeting, including the need to provide additional safeguards; mark direction of flow on inlet and outlet valves; and add user requirements on when and how these systems should be used. Mrs. Tina Butcher asked if there were any updates on this item.

NEWMA's S & T Committee chair, Ms. Jane Zulkiewicz (Barnstable) reported that Mr. Mike Sikula (NY), submitter of the item, was not present at the 2017 NCWM Interim Meeting. She stated that Mr. Sikula had requested, at the 2016 NEWMA Fall Interim meeting, another year cycle to allow time for him to address the recommendations and concerns regarding safety, misuse, clear marking of valves, and safeguards for fraud provided to him by the NIST OWM at the 2016 NCWM Annual Meeting.

In consideration of the submitter's request for additional time to work on the proposal and OWM's acknowledgement that additional development of the proposal is still needed, the Committee agreed to recommend this item move forward as Developing.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believes this item needs further development, including but not limited to what type of product(s) may be allowed or may not be allowed in such a system. An example of what type product(s) that should not be allowed in such a system would be ATF and motor oil.

The CWMA agrees with the NIST OWM concern that these devices may facilitate fraud and that further development is needed to address these concerns. CWMA recommended that this item remain in Developing status.

The SWMA received comment from Mr. Hal Prince (FL) who believed this proposal was a good start, but falls short. He stated that he feels stronger safeguards regarding fraud need to be in place before this item is ready for a vote and encourages the submitter to incorporate much stronger safeguards in the proposal to protect the consumer. Ms. Tina Butcher (OWM) recommended that this item remain developmental and has provided comments to the submitter and further stated that this item has merit, but needs additional safeguards. The Committee heard several express concerns over consumer protection with this proposal and looks forward to those issues being addressed by the submitter. SWMA recommended that the item remain in Developing status.

NEWMA received a request from the submitter to allow one more year to further develop this item. NEWMA recommended that this item remain in Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3301-3 V S.5.7. Meter Size

Background/Discussion:
The meter size is no longer pertinent information to the inspector because of changes to the product depletion test tolerance.

This requirement was added because the product depletion test tolerance was based on the meter size and without a marking requirement, the inspector could make a mistake and apply the incorrect tolerance. The product depletion test has been changed as of 2013 and the tolerance is now based on the marked flow rate of the meter.

> "T.4 **Product Depletion Test.** – The difference between the test result for any normal test and the product depletion test shall not exceed 0.5 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated higher than 380 Lpm (100 gpm) or 0.6 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated 380 Lpm (100 gpm) or lower. Test drafts shall be of the same size and run at approximately the same flow rate.
>
> **Note:** The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1. Accuracy
>
> Classes and Tolerances for Vehicle-Tank Meters.
> (Amended 2013)"

The meter size is no longer necessary for the inspector to know and therefore shall not be required to be marked.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting S&T Committee open hearings, Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, reported that the MMA supports deletion of paragraph S.5.7. Mrs. Tina Butcher (OWM) stated that since the product depletion test has changed and is currently based on the maximum flow rate marked on the device, paragraph S.5.7. should be deleted.

The Committee did not receive any comments opposing the item and considering the comments heard in support, the Committee agreed to present the item for vote at the upcoming 2017 NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA agrees with the submitter that this specification is no longer relevant and should be removed from Handbook 44 because the product depletion tolerance for these devices is no longer based on meter size. CWMA forwarded the item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3301-4 W N.4.X. Automatic Stop Mechanism, T.X. Automatic Stop Mechanism and UR.2.6. Automatic Stop Mechanism

Background/Discussion:
EPO No. 23 states that the automatic stop mechanism should stop the flow within one-half the minimum interval indicated. This requirement of the automatic stop mechanism is specific to VTMs and has a precise tolerance that is not addressed in HB 44, Section 3.31 or G-UR.4.1. If to be enforced by weights and measures personnel, the automatic stop requirement should be stated in HB 44.

2017 NCWM Interim Meeting:
At the 2017 NCWM Interim Meeting S&T Committee open hearings, several industry representatives and an OWM representative voiced opposition to the item. Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, commented that the auto-stop mechanism is a convenience and that the MMA opposes the item. Mrs. Tina Butcher (OWM) stated that the one-half minimum division tolerance specified NIST Publication 112 EPO 23 is from an unknown source and it was included in EPO 23 to provide guidance on a non-metrological function to inspectors. Mr. Michael Keilty (Endress & Hauser Flowtec AG USA) commented that the automatic-stop mechanism is *not* an NTEP evaluated item.

In consideration of the comments received and at the recommendation of item's submitter, the Committee agreed to withdraw this item.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA agrees that the Automatic Stop Mechanism tests specified in EPO 23 should be incorporated into Handbook 44. CWMA forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3302 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

3302-1 V N.3. Test Drafts.

Background / Discussion:
In the fall of 2016, Mr. Keilty provided an update to the Item under Consideration. That update appears in the agenda. The previous proposed Item under Consideration was as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

The use of transfer standards is recognized in Code Sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric

and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues. The use of transfer standard meters is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

The amended language is made to clarify the minimum test quantity for using transfer standard meters accommodating both large quantity and low quantity delivery systems.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The States commonly use meters as transfer standards to test rack meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice. However, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The submitter recommends that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Publication R 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee agreed to group together Agenda Items 330-2 and 337-3 since these items are related and announced that comments on both items would be taken together during the open hearings.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item, presented a short list of benefits to using a master meter as the standard in testing meters used in applications to measure CNG, LNG, and LPG in comparison to using volumetric or gravimetric standards. He stated that master meters are safer, more efficient, and provide a faster means of verifying meter accuracy. An additional benefit is that using a master meter eliminates the need to return product to storage because product can be dispensed through the master meter as part of the refueling procedure. He encouraged the recognition of master meters in HB 44 for use as a transfer standard in testing.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) provided written comments to the Committee concerning this item, which he summarized in comments presented during the open hearings. Mr. Oppermann stated there are significant differences between a transfer standard and a field standard. It is necessary to consider the accuracy of these standards. Field standards must satisfy the Fundamental Considerations of HB 44 Section 3.2 Tolerances for Standards, whereas transfer standards are recognized for use in some HB device codes, but do not satisfy the one-third requirement specified in Section 3.2. (*Technical Advisors note: Section 3.2. of the Fundamental Considerations requires the combined error and uncertainty of any standard used in testing to be less than one-third the applicable tolerance applied to the device under test unless corrections are made).* Mr. Oppermann recommended keeping clear this distinction, noting that the current proposal is incomplete if it doesn't include an additional tolerance when you test a device using a master meter (i.e., a transfer standard).

In response to Mr. Oppermann's comment regarding the need for an additional tolerance, Mr. Keilty stated that he isn't requesting a different tolerance be applied to the device under test. Current technology already enables the standard to comply.

Mrs. Tina Butcher (OWM) acknowledged that development of alternative methods of testing is beneficial because there are many applications where the nature of the product makes current methods impractical. She stressed, however, that adding a paragraph to HB 44, alone, doesn't provide recognition of a test method. There is a laundry list of pieces that need to be in place before a standard should be considered suitable for use in testing by providing traceability measurements including things such as:

- the accuracy of the standard (or the degree of accuracy that one can expect to achieve from using the standard) in relation to the tolerances that apply to the device being tested;
- HB 44 Fundamental Considerations – Tolerances for Standards;
- proper training and procedures for using the standard;
- training of laboratory personnel and the capability of the labs to verify the adequacy of the standard for use in testing another device; and
- collection and analysis of data obtained from having used the standard repeatedly over time.

Mrs. Butcher also noted that a USNWG has been assembled to review the different (alternative) test methods and this might be an appropriate group to review such equipment as resources allow. She also noted that the decision of whether or not to accept a particular method ultimately rests with the regulatory authority.

Mr. Dmitri Karimov (Liquid Control, LLC) noted that the Mass Flow Meters Code covers all applications where a mass flow meter is used. There are five measuring device codes within HB 44. Simply adding language to recognize the use of a particular piece of test equipment doesn't necessarily ensure its use is acceptable in testing. The decision of whether or not to use the test equipment resides with the regulatory authority where the meters are located.

The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 332-2 and 337-3 and took comments on the two items simultaneously. The Committee heard comments both in support and opposition of the proposals.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item noted there is already an allowance for a field transfer standard in the Cryogenic Liquid-Measuring Devices Code, Carbon Dioxide Liquid-Measuring Devices Code, and in the Hydrogen Gas-Measuring Code. He asked there also be an allowance for a field transfer standard in the Anhydrous Ammonia Liquid-Measuring Devices Code and Mass Flow Meters Code, noting there's already information in those codes to support using a transfer standard. He also requested the Committee consider moving these two items forward as Voting items.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) speaking on behalf of Seraphin Test Measure, Co commented that there's a difference between a transfer standard and a field standard. Field standards must comply with the NIST Handbook 105 series. A transfer standard, in order to be used for testing another device, must be accurate and repeatable over the full range of how it will be used, to include temperature, flow rates, etc. Accuracy and repeatability must not change between times when it is used. He stated that Mr. Keilty is looking at a standard to meet the Fundamental Considerations of HB 44 and it is his view (that is, Mr. Oppermann's view) that that's a field standard and not a transfer standard.

Mrs. Tina Butcher (OWM) commented that OWM believes that the development of alternative methods of testing commercial metering systems is an important issue. There are many applications in which using currently

recognized test methods may not be feasible because of product characteristics, safety, cost, access to equipment, and other factors. OWM is not opposed to adding a paragraph to the two device codes as proposed, but by doing so, it wouldn't ensure approval of any proposed test method. The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.

There are a number of things that must be considered when selecting field standards and determining whether or not they are suitable and can be used to provide traceable measurements. These factors are sometimes referred to as the "essential elements of traceability." As noted by OWM during the 2015 NCWM Interim Meeting the pieces that need to be in place before a standard should be considered suitable for use in testing by providing traceability measurements include things such as:

- the accuracy of the standard (or the degree of accuracy that one can expect to achieve from using the standard) in relation to the tolerances that apply to the device being tested;
- HB 44 Fundamental Considerations – Tolerances for Standards;
- proper training and procedures for using the standard;
- training of laboratory personnel and the capability of the labs to verify the adequacy of the standard for use in testing another device; and
- collection and analysis of data obtained from having used the standard repeatedly over time.

With regard to the relative accuracy of a particular test standard, the Fundamental Considerations in NIST HB 44 Section 3.2. Tolerances for Standards specify that when a standard is used without correction its combined error and uncertainty must be less than 1/3 of the applicable tolerance. Some of the other factors include demonstrated reliability of the device over time; device repeatability; how well it duplicates actual use; existence of documentary standards for the test equipment; availability of equipment and facilities within a state laboratory to test the equipment; and whether training has been provided for the laboratory staff, field officials, and users of the equipment. These and other factors have also been raised by others during the Committee's open hearings.

NIST OWM established a U.S. National Work Group to examine alternative test methods. A subgroup within that USNWG is presently working to establish uncertainties for selected different test methods. OWM has circulated a draft document with guidelines for collecting test data within this subgroup; once finalized, this document might be useful in collecting such data on the use of other types of standards. Currently, there are no representatives on the subcommittee to review factors that affect the uncertainties of measurements using master meters. However, several members of the larger work group have expressed interest in developing standards and test procedures for master meters in some applications. Should industry want to pursue recognition of master meters, test data may be needed to determine whether or not this is a viable method and the OWM guidelines might be used for this purpose. Collecting data to assess the test uncertainties associated with using master meters would provide useful information on the potential use of transfer standard meters (master meters) for field testing.

With regard to the specific language in the proposed new paragraph N.3.2. Transfer Standard Test, the Developer may wish to consider eliminating the phrase "test draft" and replacing it with the phrase "delivered quantity" as shown in the alternative version below. This change would be consistent with changes made in 1996 to LMD Code requirements for test drafts to better allow for the use of alternative test methods such as small volume provers.

> **N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the delivered quantity shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.**

Ms. Kristin Macey (CA) commented that if the proposal were adopted, it would allow use of a transfer standard and California would not be able to fully support it. She noted that the State of California had completed some comparison testing using the following different test methods: "pressure volume temperature," "gravimetric," and "master meter." Of the three methods compared, the master meter performed worst.

Several regulatory officials and one industry representative commented in support of the continued development of the two items. That industry representative also noted that the HB 44 definition of "transfer standard" needs to be expanded.

Mr. Keilty, in response to Mrs. Butcher's and Mr. Oppermann's comments, stated that he agreed completely. Adding the paragraph to these two codes is a step towards allowing the use of transfer standards and it's understood that there's a number of things that would need to be in place in order that they be considered suitable for use in testing. He further noted that a change to the tolerances in these two codes is not being proposed.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items.

Mr. Michael Keilty (Endress + Hauser Flowtec), the submitter, stated that he supported this item as a voting item. Mr. Alan Walker (FL) spoke in support of the item and recommended it move forward as a voting item. Mr. Dmitri Karimov (Liquid Controls) recommended limiting the application of the proposal to retail CNG testing, which was echoed by Mr. Randy Moses (Wayne) stating he supported the concept for CNG testing. Mr. Mike Sikula (NY) supported the continued investigation of this item. Mrs. Tina Butcher (OWM) stated that there is a USNWG subgroup presently working to establish uncertainties for select test methods. Currently, there are no representatives on the subcommittee to review factors that affect the uncertainties of measurements using master meters. OWM questions whether or not consideration needs to be given to providing a larger tolerance when conducting tests using a transfer standard as is done in the carbon dioxide and hydrogen codes. Testing would need to be conducted to demonstrate the magnitude of the additional tolerance. Mrs. Butcher further stated that if the current proposal passed it doesn't mean that all jurisdictions would support it.

The Committee also received written comments from Mr. Henry Oppermann (Weights and Measures Consulting, LLC) on behalf of Seraphin Test Measure Company suggesting that additional test data is needed to be able to properly evaluate whether or not a calibrated transfer standard, e.g. a master meter, can be considered a suitable standard in testing devices that dispense such products.

During the Committee's work session, members of the Committee acknowledged that both written and some verbal comments received suggested the need for additional test data. It was also acknowledged that there was a lot of support for the proposal. Those supporting the proposal had indicated that using a transfer standard is much easier and faster than testing gravimetrically and eliminates the need to discharge product from a prover into the atmosphere, which is viewed by many as a safety concern. In discussing the item, it was noted that adding a requirement recognizing the use of transfer standards to the two codes wouldn't dictate the method of testing that a jurisdiction would have to use. The proposal only recognizes the use of transfer standards in testing and the decision on whether or not to use a particular method of testing would remain with each jurisdiction. Given these considerations, the Committee agreed to present both items for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. The Committee received numerous comments from industry and regulators alike, predominantly in support of the proposals. The following are some of the more significant comments that the Committee heard in support of the proposals:

- Using a transfer standard (e.g., a calibrated master meter) provides a much safer means of testing than testing gravimetrically because the product discharged during testing goes into a receiving tank and does not get discharged into the atmosphere;
- Using a transfer standard to test provides a faster and more efficient means of testing.
- Adding language to HB 44, which recognizes the use of transfer standards in testing, provides the legal basis for using them;
- We have been using transfer standards very successfully in our state and have had no issues.

- HB 44 Fundamental Considerations does not address the test method. Only the standard has to be accurate to within one-third of the tolerance to be applied to the device being tested. *(Technical Advisor's note: This comment is in reference to the information contained in HB 44 Appendix A Fundamental Considerations paragraph 3.2. Tolerances for Standards)*

Mr. Marc Buttler (Emerson Process Management – Micro Motion) commented that he supports the adoption of both agenda items with one slight modification; replace the words "maximum discharge rate" with "maximum test rate" in proposed paragraph N.3.2. Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) commented that he fully supports the change suggested by Mr. Buttler.

There were also some comments received suggesting the need for further development of the proposals. Mrs. Tina Butcher (OWM) stated that OWM considers the development of alternative methods of testing commercial measuring systems an important issue because there are many applications in which using currently recognized test methods may not be feasible because of product characteristics, safety, cost, access to equipment, and other factors. Mrs. Butcher reiterated many of the comments offered by OWM in previous NCWM Meetings as follows:

- Modifying HB 44 as proposed does not ensure approval of any proposed test method. The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.
  There is a need for those selecting an appropriate field standard, i.e., one that is suitable and can provide traceable measurements, to consider the various "essential elements of traceability" such as:
  - The standard's demonstrated reliability over time and its repeatability;
  - How well the standard duplicates actual use;
  - The existence of documentary standards;
  - The availability of equipment and facilities within a state laboratory to test the standard; and whether training has been provided for the laboratory staff, field officials, and users of the equipment.
- The importance for field standards to meet the accuracy requirements specified in the Fundamental Considerations of NIST HB 44 Section 3.2. Tolerances for Standards. Those requirements specify that when a standard is used without correction, its combined error and uncertainty must be less than 1/3 of the applicable tolerance.
- Whether or not consideration needs to be given to providing a larger tolerance when conducting tests using a transfer standard as is done in the carbon dioxide and hydrogen codes. If so, testing would need to be conducted to demonstrate the magnitude of the additional tolerance.
- Because there is a potential for more than one type of alternative test method, the proposed language may unintentionally limit those methods from consideration. For example, the proposed language may not allow the use of a small volume prover. OWM believes more analysis is needed prior to recommending specific language for adoption.

Mrs. Butcher noted that Weights and Measures needs a system that results in:

- manufacturers knowing the requirements for the design of the standard;
- systematic and appropriate collection of measurement data on proposed new standards; and
- states (regulatory authority) having access to the measurement data to determine whether or not a standard meets the guidelines in NIST HB 44 Fundamental Considerations and side-by-side testing to compare results with existing test methods.

Mrs. Butcher provided an update on the ongoing work of the U.S. National Working Group on Alternative Test Methods (ATMs) and reported that the NTEP Measuring Sector is currently developing guidelines for use by type-evaluation laboratories when conducting evaluations using transfer standards such as master meters, small volume provers, etc. Information from this group may be useful in further developing this item.

Mrs. Butcher also offered the following new OWM comments and recommendations regarding, in particular, the proposal to add paragraph N.3.1. to NIST HB 44 Section 3.37. Mass Flow Meters Code:

- Existing paragraph N.3. Test Drafts addresses the minimum test in terms of flow rate. That is, one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate.
    - It is not clear from the proposal if the intent is to strike the existing language in paragraph N.3. The proposal does not show the existing language in the paragraph (except for its title); yet, the language is not shown as being struck.
- Proposed new paragraph N.3.1. addresses the minimum test in terms of delivery amount. That is "at least the amount delivered by the device in one minute at its normal discharge rate."
    - OWM notes that all parts of paragraph N.3.1. Minimum Test shown in Item Under Consideration are new and not just the underlined portion. The entire paragraph should be bold and underlined in the agenda.
- Proposed new paragraph N.3.1. is not consistent with the minimum test of a CNG RMFD being performed today in accordance with the NIST EPO. A test conducted at the MMQ typically takes far less than a minute to complete. Additionally, the test drafts performed at one-third, two-thirds, and three-thirds test tank capacity often are completed in less than a minute's time.
- OWM believes more work is needed to further develop the minimum test requirements in the MFM Code.

In consideration of these comments, OWM recommended the two items be downgraded to Informational.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) speaking on behalf of Seraphin Test Measure, Co., stated that he agreed with OWM's comments and supported them. He disputed the claim made by an earlier speaker that the one-third error specified in HB 44 Fundamental Considerations applies only to the test standard. Mr. Oppermann indicated that the one-third tolerance applies not only to the test standard but also the uncertainties created by using the standard. He stressed the need for regulators to be able to prove that their test results are valid and questioned how regulators would know which standards are acceptable if they didn't have the proof to support their accuracy. He further noted that transfer standards, in some cases, are no more accurate than the meter being tested and that the proposals lack a specification associated with the performance of the standard. He recommended the items be downgraded to Informational or Developmental.

During the Committee's work session, members of the Committee agreed that the comments received during the open hearings were mostly in support of the two proposals. Mr. Harshman (NIST Technical Advisor) requested that members of the Committee, in consideration of the comments OWM had made during the open hearings, review proposed new paragraph N.3.1. in Agenda Item 337-3. Mr. Harshman explained that despite only the title being bold and underlined, the entire paragraph is new. The paragraph defines the minimum test of a mass flow meter and requires each test draft be comprised of at least the amount of product delivered by the device in one minute at its normal discharge rate. Mr. Harshman indicated that this proposed requirement cannot be met by someone wanting to apply the current test procedures in the NIST EPO for retail motor fuel devices used to dispense CNG. The procedures in the EPO require a test at one-third, two-thirds, and three-thirds test tank capacity, as well as a test at the minimum measured quantity (MMQ), providing the MMQ is less than one-third test tank capacity. Mr. Harshman noted that it was his experience, in working with some of the states conducting these tests, that each of these tests typically takes less than a minute to complete and in some cases far less than a minute. Some Committee members, familiar with applying the procedures in the NIST EPO, agreed that the testing typically takes less than a minute to complete. It was also noted that the NIST EPO had been developed years ago by a work group comprised of subject matter experts.

The Committee concluded that proposed paragraph N.3.1. may conflict with existing paragraph N.3. Test Drafts, which specifies the minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. This then caused the Committee to question whether the submitter had fully considered the impact the two proposals would have on other existing requirements in the two codes, which led to the Committee's majority decision to downgrade both items to Developing and return them to the submitter.

2017 NCWM Interim Meeting:
Just prior to the 2017 NCWM Interim Meeting, the Committee agreed to amend the proposal in Agenda Item 3302-1 to that shown in Item under Consideration at the request of Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), submitter of the item. The Committee chairman, Dr. Matthew Curran (FL) announced during open hearings of the Committee at the 2017 NCWM Interim Meeting that the proposal had been changed and that the revised version had been posted on NCWM's website.

During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Item 3302-1 and 3307-2 together and took comments on these items simultaneously because it considered these items related.

Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), submitter of the item, commented that this was a voting item at the 2016 NCWM Annual Meeting during, where it was downgraded to a Developing status. He further offered the opinion that there was not a good mechanism for relaying back to the submitter what an item needs in the way of development. Having now submitted the item with amended language, he said that he would like to see this item put to a vote.

Mrs. Tina Butcher (OWM) spoke of the need for standards used in testing to comply with the tolerances for standards specified in HB 44 Appendix A - Fundamental Considerations which, she noted, requires the combined error and uncertainty of any standard used without correction to be less than one-third the applicable device tolerance. She also made evident the potential for more than one type of standard to be used in testing, noting that the tolerances specified the Carbon Dioxide Liquid-Measuring Devices Code of HB 44 increase for different test methods. She stated that the proposal seemed to address only one particular type of transfer standard, i.e., a master meter, and, as a result, the proposal could have a very limiting effect on the types of transfer standards that can be used. She also questioned the use of the term "transfer standard" and suggested that the term, "field standard" may be a more appropriate term. As a final comment, she reiterated a previous OWM comment that more data is needed of comparisons to known standards.

Mr. Bruce Swiecicki (National Propane Gas Association) reported that the National Propane Gas Association supported the item and noted its potential for efficiencies and safety benefits.

Mr. Constantine Cotsoradis (Flint Hills Resources) asked that this item be moved forward, citing the need for it due to there being systems that are already in use for this purpose.

Mr. Hal Prince (FL) asked that the item be moved forward.

Mr. Ross Anderson (NY- retired) gave an example of alternative test methods being used for like applications, such as what the ASTM does. He stated that different test methods will have different results and that variables of those methods need to be evaluated. He commented that we are currently evaluating only one variable.

In consideration of the comments heard on these two items, the Committee agreed to present them for vote at the 2017 NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believes this item should remain developing until such time that data is supplied to verify the test equipment can meet accuracy considerations as a standard.

The CWMA recognizes the need for transfer standards but until requirements are in place regarding their use the CWMA recommends that this item be withdrawn.

The SWMA batched Items 3302-1 and 3307-1 together and heard comments on both items at the same time. Mr. Hal Prince (FL) stated he supports these items and would like to see them move forward as voting items. Mr. Henry Oppermann (Seraphin) stated he was opposed to the adoption of these items and they should be withdrawn. He further stated they are not legally acceptable standards and referred to his written submission in opposition to these items. Mr. Oppermann further stated that transfer standards must meet the one third requirement and that there has

not been any data provided showing they meet the one third requirement. Ms. Tina Butcher (OWM) stated that NIST submitted a number of comments in opposition of this item as written. She stated that the use isn't merely recognized by putting it in print and these devices need traceability. Further, Ms. Butcher stated the proposal appears to be lifting language from other codes and specifically asked where the two minutes came from. She concluded by stating NIST doesn't oppose the use, but there needs to be a lot more work done before they can be used. Mr. Tim Chesser (AR) stated he was in full support of using master meters, but can't defend their use. He added that the operating conditions need to identify products and limits. The SWMA recommend that this item remain in Developing status, but urges the submitter and those opposed to it to reach a resolution as the Committee believes the item has merit and could be beneficial in the field.

NEWMA recommended that this item remain in Developing status for another year.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3302-2 D N.4.1.2. Repeatability Tests and N.4.2.4. Repeatability Tests for Type Evaluation

Background/Discussion:
The proposal is aimed to correct a number of areas of confusion. The inclusion of repeatability in the N.4.1. series indicates that repeatability is to be run at normal flow rates. There was some confusion if this was the actual intent? Running the tests only at Normal flow rates is consistently how the test was performed in the field. The amendment to N.4.1.2. clarifies this explicitly for field tests and type evaluation tests.

The new paragraph was added because NTEP has for a long time required repeatability on tests over the entire range of flow rates conducted under controlled conditions during type evaluation testing. This means anywhere between rated maximum and minimum flow rates. The code addition now formalizes and legitimizes what has been done for a long time.

Another question arose whether gross or net results could be used in repeatability tests? Obviously you can't compare net to gross but you can compare three consecutive gross or three consecutive net results. As the practice in HB44 is to test one variable at a time to the extent possible, the revision clarifies that repeatability is addressed to gross meter performance only. This can be through deactivating the ATC or just using gross values where both gross and net are available from the same test.

2017 NCWM Interim Meeting:
At the Committee's 2017 Interim Meeting open hearings, the Committee heard support for the item from Mr. Dmitri Karimov (Liquid Controls) on behalf of the MMA.

Mrs. Tina Butcher (OWM) clarified that although it is common for repeatability to be conducted at the normal flow rate, there is nothing precluding an inspector from running these tests at any valid flow rate. The meter should be expected to meet repeatability requirements at any flow rate throughout the approved range. There was also some discussion as to whether or not repeatability should only be applicable to gross or uncompensated meter readings. Some felt that the same requirements should also be applicable when testing a meter in net or compensated mode. OWM suggested that this may have unintended consequences. These may include errors or stability issues in the temperature compensation being interpreted as apparent repeatability issues.

Mr. Constantine Cotsoradis (Flint Hills Resources) also questioned whether or not repeatability requirements may be applied to the compensated, net registrations.

Mr. Michael Keilty (Endress & Hauser Flowtec AG) commented that the proposal should be further evaluated by the NTEP laboratories.

Mr. Karimov reminded the group that any changes to the requirements must consider all meter technologies and not just positive displacement (PD) meters.

Ultimately, the Committee agreed that more work was needed to develop the item and assigned it a "Developing" status.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes this item needs further clarification. CWMA did not forward this item to NCWM and recommends that it be withdrawn.

The SWMA heard comment from Mr. Henry Oppermann (Weights and Measures Consulting) that he doesn't understand why there should be a difference in repeatability between compensated and uncompensated tests. He further stated that the repeatability should be the same for both tests. The SWMA did not forward this item to NCWM and recommended that it be withdrawn as it is already specified in Publication 14.

NEWMA forwarded this item to NCWM and recommended that it be a Developing item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3302-3 V N.4.2.3. For Wholesale Devices

Background/Discussion:
At the 2016 Annual Meeting, the Committee changed the status of this item from Voting to Informational in response to recommendations by the NIST Office of Weights and Measures and the Meter Manufacturers Association.

In 2014, the Liquid-Measuring Devices (LMD) Code of NIST Handbook 44 was modified to clarify testing requirements for special tests of wholesale LMDs and to help to ensure that those tests were not conducted at flow rates less than the minimum flow rates marked by the manufacturers of the metering systems. The proposed changes outlined above would align the special test requirements for LPG and Anhydrous Ammonia Liquid-Measuring Devices with those adopted in 2014 in the LMD Code and provide consistency in testing procedures across similar measuring codes.

During training seminars for weights and measures officials and service personnel, NIST OWM and other trainers instruct students to conduct special tests slightly above the marked minimum flow rate. While an official or service agent is not precluded from setting the flow rate exactly at the marked minimum flow rate, special care must be taken to ensure that the flow rate does not drop below the marked minimum during the course of the test. This can sometimes be difficult in field environments. Flow rates can vary slightly during the course of a test draft due to factors such as changes in system pressure and the number of other devices in use within the system. If the inspector or service agent sets the flow rate exactly at the marked minimum flow rate, such variations can result in the flow rate dropping below the marked minimum flow rate for portions of the test. This could potentially result in an unfair test to the metering system. Additionally, it is sometimes difficult to control the flow rate during the course of the entire test or to even set the flow rate at "exactly" the marked minimum rate. The proposed language would provide flexibility to the inspector or service agent to conduct a special test "at" or "near" the marked minimum and still consider such a test to be valid.

This proposal would provide consistency with 2015 NIST HB 44 Section 3.30. Liquid-Measuring Devices Code, Special Tests, paragraph N.4.2.4. Special Tests, Wholesale Devices.

2016 NCWM Interim Meeting:
At the Committee's 2016 NCWM Interim Meeting open hearings, Mrs. Tina Butcher (OWM) noted that OWM had submitted this proposal to align requirements in the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code with those adopted in the LMD Code in 2014. The proposed changes would help to avoid testing below the marked minimum flow rate and avoid challenges when running a "slow-flow test" at a rate other than the marked minimum.

Mrs. Butcher further noted that the CWMA had suggested additional specificity for the term "slightly above." OWM agrees that this would be beneficial and supports such development. However, the proposed language is the same as that which was adopted by the NCWM in the LMD Code and is only intended to harmonize the two codes. Prior to the 2014 adoption of the same term in the LMD Code, the NCWM S&T Committee heard similar comments and acknowledged that the phrase leaves room for interpretation. The Committee felt the term is adequate and provides for flexibility, and hearing no other opposition to the proposal, presented the item for a vote with the phrase "slightly above." Lacking any specific suggestion, rather than delaying this proposal, OWM believes further definition of the term should be proposed as a separate issue that would also encompass the LMD Code.

Mrs. Butcher also indicated that OWM proposes modifying the title of this item to include "Special Tests" so that it reads "N.4.2.3. Special Tests, For Wholesale Devices." Paragraph N.4.2.3. is part of a larger paragraph titled "N.4.2. Special Tests."

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) commented that he supported the item.

Based on the comments received during the open hearings, the Committee agreed to present this item for vote at the Annual Meeting.

NCWM Annual Meeting
At the 2016 NCWM Annual Meeting, the Committee agreed to change the status of this item from Voting to Informational based on a recommendation from OWM, and supported by the MMA during open hearings. It was stated that the MMA believes the existing text in parts (a), (b), and (c) of paragraph N.4.2.4. For Wholesale Devices is redundant and for that reason, the MMA prefers downgrading the item to allow additional time to develop the language.

2017 NCWM Interim Meeting
In December 2016, the MMA submitted an amended version of paragraph N.4.2.3. For Wholesale Devices to the Committee to replace the original proposal that had been submitted by NIST. The MMA, in written comments provided to the Committee, noted that all LPG devices must have a minimum discharge rate marked on the device. Options (a) and (b) of paragraph N.4.2.3. would never apply because the requirement is to always choose the least of Options (a), (b), or (c), but never to go below the minimum marked flow rate. Since Option (c) is the minimum discharge rate marked on the device, it is the only possible choice. If Options (a) and/or (b) are greater than (c), then they would not be the least of the three. If they are less than (c), they cannot be applied because to do so would be to drop below the minimum marked rate. Therefore, we saw an opportunity to shorten the paragraph in a way that would have no change on the final meaning or outcome.

During the Committee's open hearings at the 2017 NCWM Interim Meeting, Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, reported that the MMA supported the amended version it had submitted to the Committee.

Mrs. Tina Butcher (OWM) commented that OWM agreed with the MMA's assessment of this paragraph and believes the proposed changes to shorten the paragraph are appropriate.

In consideration of the comments received in support of the revised version of the proposal submitted by the MMA, the Committee agreed to replace the original proposal with that which was revised by the MMA as shown in "Item under Consideration" and present the item for vote at the upcoming NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believes this item should be Informational as the MMA is currently working on changes to this item.

The CWMA believes this item is fully developed and recommends Voting status.

The SWMA received comment from Ms. Tina Butcher (OWM) that last year NIST submitted changes as a "housekeeping" measure in order to align with similar changes to other codes. The Committee believes this item is fully developed and recommended Voting status.

NEWMA believes this item if fully developed and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3305 MILK METERS

3305-1 V S.2.1. Vapor Elimination (See related items 3300-1, 3301-1, 3306-1 and 3307-1)

Background/Discussion:
The proposed changes would ensure consistency across the various measuring device codes in NIST Handbook 44. This would help ensure more uniform interpretation of the requirements and facilitate application by officials and industry.

The proposed changes will align other codes with the following changes that were made to the LPG code at the 2016 NCWM Annual Meeting.

S.2.1. Vapor Elimination. –

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 20XX)

The proposed changes make the requirement less design-specific and more focused on ensuring that the means for eliminating air or vapor are effective, including that the vent lines not be susceptible to restriction. The proposed changes also clarify that the provision for vapor elimination must be automatic in nature in order to be considered effective.

NIST OWM in its analysis of the 2016 S&T Agenda Item referenced above suggested that a similar change be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such an item on its agenda in the 2016-2017 NCWM cycle.

Note that the Mass Flow Meters Code states "means to prevent the measurement of vapor and air" while other codes state "means to prevent the passage of vapor and air through the meter," but such distinction is probably justified. Consequently, no modifications are proposed to align this language with other codes.

2017 NCWM Interim Meeting
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3300-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA considered items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 at the same time. NIST OWM will update language adopted at the 2016 NCWM Annual Meeting to these additional devices. The WWMA considered these items developed and forwarded them to NCWM, recommending Voting status.

The CWMA recognized the value of aligning the measuring device codes and forwarded this item to NCWM, recommending Voting status.

The SWMA batched items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 together and heard comments for all items at the same time. The only comments received were for item. 3300-1. See that item for details. The SWMA forwarded this item to NCWM and recommended Voting status.

NEWMA forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3306 WATER METERS

3306-1 V S.2.2.1. Air Elimination (See related items 3300-1, 3301-1, 3305-1 and 3307-1)

Background/Discussion:
The proposed changes would ensure consistency across the various measuring device codes in NIST Handbook 44. This would help ensure more uniform interpretation of the requirements and facilitate application by officials and industry.

The proposed changes will align other codes with the following changes that were made to the LPG code at the 2016 NCWM Annual Meeting.

S.2.1. Vapor Elimination. –

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 20XX)

The proposed changes make the requirement less design-specific and more focused on ensuring that the means for eliminating air or vapor are effective, including that the vent lines not be susceptible to restriction. The proposed changes also clarify that the provision for vapor elimination must be automatic in nature in order to be considered effective.

NIST OWM in its analysis of the 2016 S&T Agenda Item referenced above suggested that a similar change be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such an item on its agenda in the 2016-2017 NCWM cycle.

Note that the Mass Flow Meters Code states "means to prevent the measurement of vapor and air" while other codes state "means to prevent the passage of vapor and air through the meter," but such distinction is probably justified. Consequently, no modifications are proposed to align this language with other codes.

2017 NCWM Interim Meeting
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3300-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA considered items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 at the same time. NIST OWM will update language adopted at the 2016 NCWM Annual Meeting to these additional devices. The WWMA considered these items developed and forwarded them to NCWM, recommending Voting status.

The CWMA recognized the value of aligning the measuring device codes and forwarded this item to NCWM, recommending Voting status.

The SWMA batched items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 together and heard comments for all items at the same time. The only comments received were for item. 3300-1. See that item for details. The SWMA forwarded this item to NCWM and recommended Voting status.

NEWMA forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3307 MASS FLOW METERS

3307-1 V S.3.3. Vapor Elimination (See related items 3300-1, 3301-1, 3305-1 and 3306-1)

Background/Discussion:
The proposed changes would ensure consistency across the various measuring device codes in NIST Handbook 44. This would help ensure more uniform interpretation of the requirements and facilitate application by officials and industry.

The proposed changes will align other codes with the following changes that were made to the LPG code at the 2016 NCWM Annual Meeting.

S.2.1. Vapor Elimination. –

(a) A device shall be equipped with an effective **automatic** ~~**vapor eliminator or other effective**~~ means to prevent the passage of vapor through the meter.

(b) Vent lines from the vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 20XX)

The proposed changes make the requirement less design-specific and more focused on ensuring that the means for eliminating air or vapor are effective, including that the vent lines not be susceptible to restriction. The proposed changes also clarify that the provision for vapor elimination must be automatic in nature in order to be considered effective.

NIST OWM in its analysis of the 2016 S&T Agenda Item referenced above suggested that a similar change be proposed, where necessary, to corresponding requirements in other measuring codes and encouraged the Committee to consider including such an item on its agenda in the 2016-2017 NCWM cycle.

Note that the Mass Flow Meters Code states "means to prevent the measurement of vapor and air" while other codes state "means to prevent the passage of vapor and air through the meter," but such distinction is probably justified. Consequently, no modifications are proposed to align this language with other codes.

2017 NCWM Interim Meeting
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3300-1, 3301-1, 3305-1, 3306-1, and 3307-1 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3300-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations(Fall 2016 Conferences):
The WWMA considered items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 at the same time. NIST OWM will update language adopted at the 2016 NCWM Annual Meeting to these additional devices. The WWMA considered these items developed and forwarded them to NCWM, recommending Voting status.

The CWMA recognized the value of aligning the measuring device codes and forwarded this item to NCWM, recommending Voting status.

The SWMA batched items 3300-1, 3301-1, 3305-1, 3306-1 and 3307-1 together and heard comments for all items at the same time. The only comments received were for item. 3300-1. See that item for details. The SWMA forwarded this item to NCWM and recommended Voting status.

NEWMA forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3307-2 V N.3. Test Drafts.

Background / Discussion:
In the fall of 2016, Mr. Keilty provided an update to the Item under Consideration. That update appears in the agenda. The previous proposed Item under Consideration was as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

The use of transfer standards is recognized in Code Sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues. The use of transfer standard meters is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

The amended language is made to clarify the minimum test quantity for using transfer standard meters accommodating both large quantity and low quantity delivery systems.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The States commonly use meters as transfer standards to test rack meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice. However, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The submitter recommends that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Publication R 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee agreed to group together Agenda Items 330-2 and 337-3 since these items are related and announced that comments on both items would be taken together during the open hearings. Refer to Agenda Item 330-2 for a summary of the comments heard concerning these two items. The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

2015 NCWM Annual Meeting:
At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 332-2 and 337-3 and took comments on the two items simultaneously. See Agenda Item 332-1 for a summary of comments received on these two items. In consideration of the comments received in support of the two agenda items, the Committee agreed to maintain the Developing status of both items.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. See Item 332-5 for a summary of the comments received during the Committee's open hearings and the Committee's discussions and considerations concerning these two items. Based on the comments received during the open hearings, the Committee agreed to present both items for vote at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, the Committee grouped Items 332-5 and 337-3 together and comments were taken simultaneously on these two items. See Agenda Item 332-5 for a summary of comments heard on these two items. In consideration of the comments, the Committee agreed by majority to downgrade the status of these two items to Developing and return them to the submitter

2017 NCWM Interim Meeting:
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Item 3302-1 and 3307-2 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3302-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA believes this type of device will not allow the time consideration as found in N.3.1., Also this section should be bold and underlined as it is entirely new. The submitter also needs to supply test data to verify the test equipment can meet accuracy considerations as a standard. The WWMA recommended that this item remain Developing status.

The CWMA recognizes the need for transfer standards but until requirements are in place regarding their use the CWMA recommends that this item be withdrawn.

The SWMA batched Items 3302-1 and 3307-1 together and heard comments both items at the same time. Mr. Hal Prince (FL) stated he supports these items and would like to see them move forward as voting items. Mr. Henry Oppermann (Seraphin) stated he was opposed to the adoption of these items and they should be withdrawn. He further stated they are not legally acceptable standards and referred to his written submission in opposition to these items. Mr. Oppermann further stated that transfer standards must meet the one third requirement and that there has not been any data provided showing they meet the one third requirement. Ms. Tina Butcher (OWM) stated that NIST submitted a number of comments in opposition of this item as written. She stated that the use isn't merely recognized by putting it in print and these devices need traceability. Further, Ms. Butcher stated the proposal appears to be lifting language from other codes and specifically asked where the two minutes came from. She concluded by stating NIST doesn't oppose the use, but there needs to be a lot more work done before they can be used. Mr. Tim Chesser (AR) stated he was in full support of using master meters, but can't defend their use. He added that the operating conditions need to identify products and limits. The SWMA recommend that this item

remain in Developing status, but urges the submitter and those opposed to it to reach a resolution as the Committee believes the item has merit and could be beneficial in the field.

NEWMA recommended that this item remain in Developing status for another year.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3504 TAXIMETERS

3504-1 V A.2. Exceptions. (See related item 3600-6)

Background/Discussion:

Proposed change (1):

The appearance of new types of transportation-for-hire services that use location services (such as GPS) and software applications as an interface for the user and provider of the service has created a need for regulatory standards that could be applied to these types of systems. These systems, being referred to as Transportation Network Measurement Systems (TNMS) do not use a conventional "taximeter" or other dedicated hardware devices that conform to the more traditional design of taximeters however, they provide a similar transportation-for-hire service. Regulatory officials have met with little or no success in attempts to apply existing standards (including those in Section 5.54 Taximeters Code) to TNMS due to differences in the design of these systems and other, existing types of transportation-for-hire services. The hardware components used in TNMS are devices (cellular telephones, computers, tablets) that are typically owned/possessed by the drivers and passengers using the systems and are not designed, sold, issued, or otherwise provide by the Transportation Network Companies. Since there is an absence of dedicated physical hardware used in these systems and because the primary components that are integral to the TNMS consist of various software programs, many members of the weights and measures community and transportation industry have concluded that a new documentary standard, separate from the existing Taximeters Code, is needed.

TNMS have established a large customer base in the transportation-for-hire marketplace and these systems are used extensively in the U.S. as well as internationally. There is a preponderance of public and political support to recognize and accept TNMS as fair-market competition to traditional taxi services. To that point, reasonable and appropriate standards that can be applied for the evaluation of TNMS as commercial systems must be developed and implemented. Primary goals of the implementation of a TNMS code (as well as corresponding changes to the Taximeters code) are to ensure a level playing field within this industry, ensure fair and equitable transactions, ensure transparency for consumers, and to facilitate value comparisons.

The USNWG on Taximeters has worked on the updating of the NIST HB44 Taximeters Code as well as the development of appropriate requirements for transportation systems using location services and software applications since the later portion of 2012. More recently, Transportation Network Companies (TNCs) that are the providers of TNMS have joined this effort and added their input into the standards development process. Because there are instances where taximeters are now being designed to operate using similar features and functionality as TNMS, the USNWG on Taximeters has also developed corresponding changes to the NIST HB44 Taximeters Code in an effort to provide a regulatory parity between these transportation-for-hire industry competitors. Those proposed changes to the Taximeters Code will be submitted under a separate item that already appears on the Committee's agenda (Item 3504-1 on the Committee's 2017 draft agenda) as a "carryover" item.

Proposed change (2):

Anticipating that the proposal to add a new Transportation Network Measurement Systems Code in HB44 will be adopted, there will be a corresponding need to clarify that the existing HB44, 5.54. Taximeters Code will not be applicable to these types of systems. The addition of an exemption under paragraph A.2. in the current Taximeters Code for transportation network measurement systems (TNMS) will make this clear. While this amendment to provide an exemption for TNMS in the current Taximeters Code is to be proposed also under a different agenda item (Item 3504-1, as described above), it is essential that this proposed change be a part of the TNMS item as well. This will help avoid any conflict and confusion regarding the application of the proposed tentative code should this other agenda item should a decision be made to reject or delay Item 3504-1.

Some in the weights and measures community and the transportation-for-hire industry have opposed the development of a new separate HB44 Code for TNMS stating that since those systems perform the same function as a taximeter, TNMS should be assessed based on requirements already existing in the HB44 Taximeters Code. Additional arguments that cite the lack of regulatory standards for TNMS are pointing out the loss of revenue of the traditional-type taxi services due to the increase of competition from TNMS operating in the same jurisdiction. The loss of business being reported by some in the taxi industry has also reportedly resulted in a severe decrease of the value of medallions in many areas where medallions are purchased by taxi companies as a prerequisite to operate in those particular jurisdictions.

Because these system's design and functions are considerably different from the current design of today's taximeters, there are differences between the proposed new HB44 TNMS Code and requirements that are already in (or are proposed to be added to) the existing HB44 Taximeters Code. Some may view the differences between these standards as being unfair and as providing advantages to one over the other; however, the changes that are being proposed under Item 3504-1 should bring the two codes into closer alignment. Additionally, this does not preclude the possibility of a future proposal to merge the two codes as technology evolves.

2017 NCWM Interim Meeting

At the 2017 NCWM Interim Meeting, the Committee agreed to group Agenda Items 3504-1 and 3600-6 together and take comments on these items simultaneously because it considered these items related.

The Committee received numerous comments from participants of the USNWG on Taximeters and others, including industry representatives and regulatory officials alike, indicating the two items were fully developed and recommending they be presented for vote at the upcoming NCWM Annual Meeting.

Mr. John Barton (OWM and Technical Advisor to the USNWG on Taximeters) commented that he agreed with the WWMA's changes to paragraph A.2 of the Taximeters Code that provide for an exception of that code applying to TNMSs. He noted that OWM recognizes the importance and the urgent need for regulatory standards that are applicable to Transportation Network Measurement Systems since these types of transportation services have been in use for some time and existing HB 44 requirements do not sufficiently address this type of system. He also acknowledged the efforts of the USNWG on Taximeters for the development of this proposal to meet the needs of this industry and the officials responsible for their regulation.

The new draft TNMSs code is proposed as tentative HB 44 code and is not intended for enforcement use at this time. He further stated that OWM acknowledges the challenges in the development of regulatory standards for these systems based on their extensive use of software and location services such as GPS and cellular networks. Because there is no precedent for these types of transportation systems, OWM believes that it is important to introduce regulatory standards for TNMS on a "trial" basis. This will allow for the identification of any necessary modifications to the tentative code prior to being used as an enforcement tool.

The Committee also received comments from Mr. Stan Toy (Santa Clara County Weights and Measures, State of California) requesting amendments to the following draft tentative code paragraphs:

- S.1.1. General Indicating Elements - *Summary of the comments provided:* The model, age, and condition of a cell phone can affect its performance capabilities. I would suggest deleting the word "driver" and test 100 percent or at least a sample of the devices that are in use.
- N.1.2.2. Additional Tests. – *Summary of the comments provided:* Why do so many tests need to be completed before taking action? There are no other devices that we test where this is required. Officials should be permitted to take a device out of service with one test that fails to comply. How many failures does it take before officials can reject: 2 out of the 4, 3 out of the 4, etc.,? Each test must be done on a road and takes about 30-45 minutes to complete. How are officials to schedule a work day given how much time it might take to test a particular device that fails one or more tests? I recommend changing the word "shall" to "may" in this paragraph.
- N.1.3.2., Roads. - *Summary of the comments provided:* The paragraph requires tests to be conducted on public roads that are in good repair. What is good repair? Another concern is requiring the tests to be conducted on public roads. Mapping systems are based on public roads. In rural areas, Uber claims their system can calculate charges on driveways of customers. These are not public roads.
- S.3.2. Significant Trip Data Loss. - *Summary of the comments provided:* The paragraph needs to include limits on how frequently this can occur, e.g., 10 percent of the time, 90 percent of the time, etc. A loss signal allows a different rate structure to be charged.

Mr. Barton, in response to Mr. Toy's concerns, noted that the draft code, if adopted, would be added to HB 44 as a tentative code during which time, it could be determined whether or not changes to any of the paragraphs were needed before that status were changed to a permanent code. With regard to verifying repeatability of these devices, the Work Group considered this issue extensively and concluded there is no need to test each and every driver's cell phone.

Mr. Bob O'Leary (Uber Technologies, Inc.) stated that he supported Item 3600-6 as a tentative code and said also he would like to address some of Mr. Toy's concerns. He reported that the Work Group had extensively debated the issues being raised. With respect to suggesting that all devices be tested, a TNMS uses data from all phones to determine which road segment a driver drove on. Plug in any IOS or Android phone and get good results. There is no evidence to support the regulatory burden of requiring all devices to be tested. Regarding the need to test on public roads, it is important that the tests be conducted on public roads. The system can't function when off public roads. Mr. O'Leary also stated that there is a misconception that Uber is unregulated, when in fact, most states do regulate Uber.

In consideration of the comments received, the Committee agreed to present both items in the group for vote at the upcoming NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA noted that the original proposal did not reflect an amendment to A.2. Exceptions that was adopted at the 2016 NCWM Annual Meeting. The Item under Consideration now reflects the updated paragraph. WWMA considered this item with Item 3600-6 and forwarded these items to NCWM recommending them as Voting items. WWMA further recommends that both items be voted upon in a single vote of NCWM.

The CWMA supports the work group and believes this item is fully developed. CWMA recommended that this be a Voting item.

The SWMA batched items 3504-1 and 3600-6 together and heard comments for both items at the same time. Mr. Bob O'Leary (Uber) stated that the USNWG had developed a new code over the last year. He further stated that the workgroup has come to consensus with this draft code and believed it is ready for a vote. Mr. O'Leary concluded by stating he is looking forward to its adoption in July. Mr. James Cassidy (Cambridge, MA) spoke in support of these items and noted that the code is a tentative code, which needs to be adopted. Ms. Kristin Macey (CA) noted that both Mr. Cassidy and she were a part of this process within the workgroup and stated that the code has been vetted at all levels of government, in particular those that conduct taximeter testing. She further noted that this new

technology is a system and not a device. Ms. Macey concluded by stating that this new type of system must be tested using transfer standards. The SWMA believes this item is fully developed and forwarded it to NCWM, recommending Voting status.

NEWMA expressed appreciation for the hard work and many meetings of the USNWG on Taximeters. NEWMA believes the item is ready for adoption and forwarded it to NCWM, recommending Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3504-2 V USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System-Based Systems for Time and Distance Measurement

Note: This item was originally titled "Item 360-5 S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda. At the 2013 NCWM Interim Meeting, the Committee combined that item with "Item 354-1 Global Positioning Systems for Taximeters" and "Item 360-6 Global Positioning Systems for Taximeters" to create this new, consolidated item to address the development of recommendations on multiple topics related to taximeters and GPS-based time and distance measuring systems.

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

John Barton
Chairman to the NIST USNWG on Taximeters
301-975-4002
john.barton@nist.gov

Background / Discussion:
The Committee has received multiple proposals over the past several years related to updating the NIST Handbook 44 Taximeters Code to reflect current technology as well as a request to establish criteria for GPS-based time and distance measuring systems. In April 2012, NIST OWM established a U.S. National Working Group to work on these issues.

The USNWG on Taximeters has submitted a number of proposed changes to the HB44 Taximeters Code over the past 2-3 years. These initial changes were focused primarily on updating the code to account for the use of more advanced equipment (e.g., Passenger Information Monitors or PIMs, Mobile Data Terminals or MDTs, credit card readers, printers).

More recently, the work group's efforts were focused on the development of standards intended for "transportation network measurement systems" (TNMS) that calculate passenger fares based on time and distance derived from location services. A characteristic of TNMS that prompted the work group to develop separate requirements was the manner in which the consumer (rider) acquired this type of service and the means provided as an interface between rider, driver, and transportation network company. This interface is typically in the form of a software application program or "app." The recognition that the TNMS are almost entirely software-based was another factor that moved the USNWG to develop a separate set of requirements for these systems. The proposal for this new TNMS code has been submitted for consideration as a new item in the S&T Committee.

During the USNWG meeting discussions, the work group members recognized that when developing new requirements for TNMS or modifying requirements for taximeters there was a potential risk of creating unintended, unfair advantages for either type of device. Since these devices are used to calculate charges for the same type of service, the work group believed that there should be a parallel set of requirements.

The USNWG members also recognized that the traditional-type of taximeters were evolving in such a way that would incorporate some of the technologies used within TNMS and that the differences between the two type of devices/system were becoming less clearly defined. This prompted the work group to develop the two separate codes in some ways where they will mirror each other in certain sections.

The USNWG has now finalized a draft for proposed changes in the NIST Handbook 44 Taximeters Code which is being submitted for consideration as a voting item. For details of those meetings as well as the details for requirements and changes to those requirements being proposed by the USNWG, please contact Mr. John Barton as noted in the Item Under Consideration.

2017 NCWM Interim Meeting

During the 2017 NCWM Interim Meeting, the Committee received numerous comments in support of this item from industry representatives and regulatory officials alike recommending it be presented for vote at the upcoming NCWM Annual Meeting.

Mr. John Barton (OWM and NIST Technical Advisor to the USNWG on Taximeters) stated that this proposal is intended to address the use of evolving technologies in the taxi industry and that these proposed changes were also developed to mitigate or eliminate any possible disparity between HB 44 requirements applicable to taximeters and the new requirements being proposed in the Transportation Network Measurement Systems (TNMS) Code under S&T item 3600-6. Mr. Barton noted that OWM acknowledges the importance of establishing parallel standards that facilitate fair and equal regulation of devices and systems being used in the same or similar types of services, such as taximeters used by the traditional taxi industry and the use of TNMS by Transportation Network Companies (TNCs). OWM believes that if a new HB 44 TNMS Code is adopted (as is being proposed under item 3600-6), the changes being recommended in the existing HB 44 Taximeters Code are necessary to maintain an equitable balance in the application of regulatory standards for both types of transportation services.

Mr. Barton noted that many of the changes being proposed are intended to facilitate the use of location services (such as GPS) by taximeters to determine distance travelled. Other proposed changes would allow taximeters to calculate fare charges using time elapsed and distance travelled simultaneously. These features are characteristically found in TNMS and the changes, if adopted, would also allow this in taximeters and would permit taximeters to compete on a more equal basis. Other changes proposed in this item would account for the use of software applications or "apps" installed on passenger-owned devices as a convenience to customers of taxi services. Reportedly, some taxi services are already offering this type of feature and OWM believes that taxi services should be permitted to also use the same type of technology being used by TNCs in their products.

Mr. Barton also noted that OWM sees a benefit in the changes proposed that would allow taximeters to be sealed by other than physical means. Other commercial weighing and measuring devices have been permitted to use electronic forms of security seals and recognizing the technological evolution of taximeters and their increasing use of software (as in all other types of devices) it is considered reasonable to permit this type of sealing in taximeters.

Many of the proposed changes will expressly permit taxis to expand their functionality by using non-traditional technologies. Some changes being proposed in the existing HB 44 Taximeters Code are restrictive in nature and would require taximeters to comply with requirements that correspond to requirements found in the proposed new TNMS Code.

Mr. Barton also reported that OWM believes adding a definition in HB 44 Appendix D as proposed in this item would be of benefit and will provide a clear understanding for the use of the term "location services." It is recognized that there are a number of systems and networks that can be used in place of or in conjunction with GPS to locate a geographical position of a for-hire vehicle. Simply using "GPS" to refer to any of services/systems that could be used to calculate distance travelled is overly simplistic and likely often incorrect. Since this term is being proposed to be included in both the amended Taximeters Code and the proposed new TNMS Code, it is considered a necessary change to HB 44.

Mr. Stan Toy (Santa Clara County Weights and Measures, State of California) stated that he had concerns similar to those made evident in comments he had provided regarding the draft tentative TNMSs code proposed in Agenda Item 3600-6 with some of the proposed requirements in the existing Taximeters Code. He then reiterated concerns he had with:

- the number of tests required under proposed new paragraph N.1.2.1. Taximeters Using Measurement Data Sources Other Than Rotation of Wheels to be able to reject a device for failing performance requirements;
- having to conduct tests on public roads that are in good repair as specified in proposed new paragraph N.1.3.2.1. Roads; and
- neglecting to include limits on the frequency of signal loss in proposed new paragraph S.7.2. Significant Trip Data Loss.

Mr. Barton noted that significant trip data loss is invariably going to occur in places where the signal is lost, to which Mr. Toy responded that he understands there will be instances where the signal is lost; his concern is how often it occurs.

In consideration of the comments received on this item, the Committee agreed to present if for vote at the upcoming 2017 NCWM Annual Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA did not have the opportunity to review and comment on the updated language for this item because the USNWG was still considering final language during the WWMA conference.

The CWMA looks forward the continued development of this item by the USNWG on Taximeters and recommended that it remain in Developing status.

The SWMA received no comments for this item. The Committee believes this item is fully developed and recommended Voting status.

NEWMA supports the workgroup and recommends that this item be a Voting item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3508 MULTIPLE DIMENSION MEASURING DEVICES

3508-1 V S.1.7. Minimum Measurement ~~Lengths~~ and S.1.8. Indications Below Minimum and Above Maximum

Background/Discussion:
The MDMD Work Group believes that the expansion of S.1.7. to include multi-interval devices with the additional proposed changes provides a better explanation of how to apply the 12 d minimum measurement specification and the application of tare with respect to marked maximum dimension for the axes in which tare was applied.

This proposal also addresses the change in the use of the word "length" and recommends the use of the word "measurement". The Work Group feels that "measurement" is better suited for all axes.

These proposed changes better harmonize the device specifications with those of Measurement Canada.

2017 NCWM Interim Meeting

At the 2017 NCWM Interim Meeting, the Committee heard comments of support for this item as written from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, Ms. Fran Elson-Houston (Ohio Department of Agriculture), and Mr. Richard Suiter (Richard Suiter Consulting).

Mr. Richard Harshman (OWM) commented that OWM believes the proposed changes to both paragraphs in this proposal are appropriate. The 12 division minimum specified in paragraph S.1.7. is intended to apply not only to the length of an item being measured as is currently specified in the paragraph, but also the width and height of the item. Replacing the word "length" with "measurement" in these two paragraphs will make clear the application of the 12 division minimum measurement to each axis (L, W, and H).

In consideration of the comments received in support of this item, the Committee agreed to recommend the item for a vote.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA considered this item to be fully developed and forwarded it to NCWM, recommending it as a Voting item.

The CWMA believes this item is fully developed and recommended that it be a Voting item.

The SWMA received no comments for this item. The Committee believes this item is fully developed and recommended Voting status.

NEWMA forwarded this item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3508-2 W T.3. Tolerance Values (See also items 3200-7, 3201-1, 3204-1, 3205-1, 3509-1 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each Code has a specific statement along the lines of:
>
> The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
> or
> The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.
>
> However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
2.21	Belt-Conveyor	Not specified
2.24	AWS	positive/negative
2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.

Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gal that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-7 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3509 ELECTRONIC LIVESTOCK, MEAT, AND POULTRY EVALUATION SYSTEMS

3509-1 W T.1. Tolerances on Individual Measurements (See related items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2 and 3600-4)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each Code has a specific statement along the lines of:
>
> The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
> or
> The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.
>
> However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
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2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

> I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.
>
> Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gal that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-7 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600 OTHER ITEMS

3600-1 D Electric Watthour Meters Code under Development

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Tina Butcher
Chairman to the NIST USNWG on Electric Vehicle Refueling and Submetering
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or

Juana Williams
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Background/Discussion:
The creation of Developing Items on both the L&R and S&T Committee agendas will provide for a venue to allow the USNWG to update the weights and measures community on continued work to develop test procedures and test equipment standards. This item will also provide a forum for reporting on work to develop proposed method of sale requirements for electric watthour meters and a tentative device code for electric watthour meters in residential and business locations and serve as a placeholder for eventual submission of these proposals for consideration by NCWM.

2016 NCWM Interim Meeting:
At the 2016 NCWM Interim Meeting, the Committee received an update on the progress of this item from Mrs. Tina Butcher (OWM). Several officials voiced support for the continued development of the Electric Watthour Meters Code. In consideration of the comments received in support of the item, the Committee agreed to recommend the item continue in a "developing" status.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Mrs. Tina Butcher (OWM) provided an update on the development of this item, which summarized the following written OWM comments and recommendations provided to the Committee during the meeting:

The USNWG on Electric Vehicle Fueling & Submetering last met on July 6, 2016. The following summarizes key activities and issues currently under development in the USNWG:

- Restructuring of USNWG:
  Since its inception, the scope of the USNWG has included the development of proposed standards, test procedures, and other requirements for (1) electric vehicle fueling systems; and (2) electric watthour meters used as submeters (in applications falling under the jurisdiction of weights and measures jurisdictions). Following the adoption by the NCWM of the Tentative Code on Electric Vehicle Fueling Systems in July 2015, the USNWG recognized that individuals may have an interest in only one or the other topic, though some may have an interest in both areas. The USWNG is reviewing proposed modifications to its charter which will restructure the WG into one subgroup to address electric vehicle refueling and another subgroup to address electric watthour meters. This will allow the group to more efficiently address these two areas of work.

- Test Equipment & Test Procedures for Electric Vehicle Fueling Systems:
  A subcommittee, chaired by Ted Bohn, Argonne National Laboratory, continues to work on the development of recommended criteria for test equipment and test procedures. The Subcommittee last met in March 2016. Multiple field trials are planned to vet proposed test procedures. At least two companies have developed prototype field standards for use by weights and measures jurisdictions and service personnel for testing EVSE in the field.

- Electric Watt Hour Meters:
  A draft NIST Handbook 44 code for electric watthour meters was circulated to the USNWG in November 2015. This draft was extracted from an original draft code drafted by NIST several years ago that included requirements for both electric watthour meters and electric vehicle refueling systems.

The USNWG plans to hold an in-person meeting late fall 2016 to continue work on the draft code. Both California Division of Measurement Standards and Ohio Weights & Measures have graciously offered to host this meeting.

In consideration of the ongoing work on this item, the Committee agreed to maintain its Developing status.

2017 NCWM Interim Meeting

Mrs. Tina Butcher (OWM), Chairman of the USNWG on Electric Vehicle Refueling & Submetering, provided an update on the progress of the USNWG. She noted that, when the USNWG was initially created, it was charged with addressing *all* electric submeters, including commercial electric vehicle refueling systems as well as commercial utility-type electric watthour meters under the purview of weights and measures jurisdictions (rather than public utility commissions or similar entities). Shortly after beginning its work, the USNWG agreed to focus its initial efforts on developing proposed requirements, test procedures, and field standard criteria for commercial electric vehicle refueling metering systems. In July 2015, after several years of intensive work by the USNWG, a tentative code for electric vehicle refueling systems was presented to and adopted by the NCWM.

In December 2015, the USNWG discussed plans to resume work on electric watthour meter requirements, including the development of a proposed NIST HB 44 code. A draft code derived from one initially circulated in 2014 was re-distributed to the USNWG in December 2015, with a deadline for comments in February 2016. This deadline was ultimately extended to March 2016 at the request of some work group members. The USNWG recently agreed upon revisions to its charter, which includes dividing the larger USNWG into two parts: one to address Electric Vehicle Refueling Equipment and one to address Electric Watthour Metering Systems. OWM continues to analyze and compile comments received on the draft code.

Work continues on test equipment standards and test procedures for Electric Vehicle Refueling Equipment, under a subcommittee, Chaired by Mr. Ted Bohn, (Argonne National Laboratory), within the original USNWG. The USNWG's next step is to reconvene the USNWG and begin review of the comments on the draft watthour meters code. The Technical Advisor to the USNWG, Ms. Juana Williams, will be polling members on dates for (1) a short, web-based conference to review the overall plan for drafting requirements and procedures for watthour meters; and (2) an in-person meeting to begin reviewing and discussing comments received on the draft NIST Handbook 44 watthour meters code and agreeing upon needed changes. NIST OWM appreciates the diligent work of the USNWG members in collaborating on the development of these much-needed standards.

Those interested in the work can contact Mrs. Tina Butcher, Chairman, at tbucher@nist.gov or Ms. Juana Williams, Technical Advisor, at jwilliams@nist.gov.

Regional Association Comments and Recommendations(Fall 2016 Conferences):

The WWMA believes this item should remain a Developing item as the USNWG continues its work.

The CWMA supports the continued development of this item and recommends that it remain in Developing status.

The SWMA received a request from Ms. Tina Butcher (OWM) that item remain developing and provided a history of the workgroup. The SWMA looks forward to the progress of the workgroup and recommended that the item remain in Developing status.

NEWMA supports the continued development of this item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600-2 D Appendix A – Fundamental Considerations: Section 4.4. General Considerations (See related items 3100-1 and 3200-5)

Background/Discussion:
The submitter modified the proposal after the WWMA meeting. The item under consideration now represents the revised version. The original that was presented at WWMA was as follows:

4**.4. General Considerations.** – **Code requirements are applied only to a single device or system, unless specifically stated in the code. The official may encounter equipment where the digital indications from more than one device are electronically summed. This may be done in multiple ways. Each device may have its own indicating element and the sum is indicated on a separate, associated indicator which is interfaced directly with each device (i.e. a computer or console via cable or even bluetooth wireless communication). The indicating elements of the individual devices may be enclosed in a single housing, with separate indicators for each device and a separate indicator for the electronic sum. An electronic sum of measured values from multiple devices is not subject to code requirements, except that it be mathematically correct, i.e. add up to the proper sum - See General Code G-S.5.2.2.(e).**

The simpler the commercial device, the fewer are the specification requirements affecting it, and the more easily and quickly can adequate inspection be made. As mechanical complexity increases, however, inspection becomes increasingly important and more time consuming, because the opportunities for the existence of faulty conditions are multiplied. It is on the relatively complex device, too, that the official must be on the alert to discover any modification that may have been made by an operator that might adversely affect the proper functioning of the device.

It is essential for the officials to familiarize themselves with the design and operating characteristics of the devices that he inspects and tests. Such knowledge can be obtained from the catalogs and advertising literature of device manufacturers, from trained service persons and plant engineers, from observation of the operations performed by service persons when reconditioning equipment in the field, and from a study of the devices themselves.

Inspection should include any auxiliary equipment and general conditions external to the device that may affect its performance characteristics. In order to prolong the life of the equipment and forestall rejection, inspection should also include observation of the general maintenance of the device and of the proper functioning of all required elements. The official should look for worn or weakened mechanical parts, leaks in volumetric equipment, or elements in need of cleaning.

The submitter provided the following comments:

Some are now coming to understand that the NCWM made a mistake in 1990 in interpreting how we apply the code requirements to the three-platform, three-indicator truck scale with a fourth summed indication. In any suggestion that a Code should be changed or reinterpreted, there is an unstated requirement that there must be some conflict that needs resolution. Often the difficult part is in just identifying the conflict or in finding the right question to expose the conflict to others and, in doing so, possibly point to the resolution. Some might think there is no conflict and there is no issue, but I must disagree.

What stands out on this issue to me is the huge divide between the public sector and private sector on this issue. It was black and white in 1989, good guys vs the bad guys. The public sector, me included, saw the issue one way while the scale industry almost unilaterally saw it differently. As I think back over my career, I find it hard to find a many issues where consensus between the two sides eluded the NCWM as it did for this issue. In my experience, the scale industry works toward consensus as earnestly as the public sector. If there is no consensus here, this should bother us all and encourage us to try to understand why.

If we ask the question on our current issue, as Henry Oppermann has, it goes like this: How do we apply the Scales Code requirements to a three-platform scale with three independent weight indications and a fourth indication of the sum of the three independent platforms? His answer follows his logic of the "duck test." Quoting him, "if a scale looks like truck scale, operates like a truck scale, and weights trucks, then it is a truck scale."

It is important to note that a parallel issue was on the 2016 S&T agenda dealing with the v(min) requirement for these three-platform scales with three independent indicators. However, in dealing with this small part of the larger issue, the Committee has chose ignored the larger issue for now. In my testimony at the 2016 interim meetings, I pointed out that the v(min) change would result in a mixed state of being. Part of our interpretation would treat the three scales as three i.e. for v(min), but treat them as one for all other requirements. Does this make sense?

I see an immediate problem here, as Henry's quote is based on thinking from 1989, and I'll suggest much earlier, pre-1986 to be exact. We can see this in Tables 7b. and 7a. in the Scales Code. These tables deal with selection requirements for unmarked scales and marked scales. Table 7b. reflects that pre-1986 thought process where the application of the unmarked device determined what technical and performance requirements would apply. This is the model implied in Henry's comment and in the thought process we see from the S&T Committee as it wrestled with this issue in 1990. Quoting from page 157 of the 1990 S&T final Report: "The classification of a scale or weighing system into an accuracy class should be based upon its application and method of use, not on the design of the device." In the same paragraph the report also notes, "The significance of this interpretation is that not only must each independent weighing device meet the requirements of Handbook 44, but the entire weighing system must meet all requirements that would apply <u>if the device were a single scale</u>." (emphasis added) This was voted on and approved by the public sector voters of the NCWM with strong (non-voting) opposition from the scale industry.

Looking at that last statement in the S&T report today, does it even make sense? Table 7a. made a radical departure from the pre-1986 way of thinking. Under the "New" Scales Code which took effect January 1, 1986, the technical and performance requirements were determined by the class designation that was chosen and marked on the device by the manufacturer. In the wording of the table, it is a typical application of the class. Thus the requirements apply based on the class designation as marked by the manufacturer and the device is adapted to the application. To me this contradicts the S&T conclusions in 1990.

I'm suggesting that a "duck test" is not valid for marked devices. For example, there is no single set of requirements for a marked truck scale. By this I mean one can use a class III or a class IIIL scale to weigh trucks and the requirements are therefore very different. This was impossible to imagine prior to 1986 under the "Old" Scales Code. It is the manufacturer, in the design and production phases, who determines and marks the class. It is the marked class that determines which technical requirements will be applied to the device, and this is done before it leaves the plant. The code recognizes that the manufacturer has no means to limit the application once the purchaser buys the device. Whether a device is suitable is a separate question and has a separate requirement, i.e. G-UR.1.

I believe the "duck test" is not valid for the entire Handbook. For me the critical issue we have to address is how to apply code requirements in general. The simple direct answer is, we apply code requirements to <u>a</u> device. That is how the requirements are written, in the singular. Why is this singularity important? The answer lies in unstated general principles in Handbook 44 which we can elicit by asking, "How do we measure quantities of things in commerce, generally?" By generally, I mean across all Codes. My answer is that the Codes clearly allow multiple solutions to that question. I'll state this more specifically:

A commodity exchanged in commerce may be measured:

A. as a single draft measured using a single measuring instrument.

B. as the sum of measurements of sub-parts of the whole using multiple drafts on a single measuring instrument.
C. as the sum of measurements of sub-parts of the whole using multiple drafts of multiple measuring instruments.

It must be noted that the instrument used in any of the options A through C, must be suitable for service when measuring the whole or the sub-part in conformance with G-UR.1. For the purposes of this discussion we will stipulate that all measuring instruments involved are suitable for service, whether measuring the whole or the sub-part. For example, all weighments are stipulated to be greater than the recommended minimum load in Table 8 or liquid quantities in conformance with G-UR.1.3.

A couple of examples might help. I don't think I need to illustrate option A, as it is the most common solution. Option B can be seen with an Automatic Bulk Weighing system which operates by summing multiple drafts weighed on the same scale to provide a total weight of the whole commodity. But I could also do option B using VTM's. I could make multiple deliveries from a single VTM unit to fill a large customer order, i.e. larger than the tank capacity of the single VTM. Alternatively, I could fill that order using drafts from multiple VTM units, option C.

Our assumption in accepting each of these options is that the sum of measurements from multiple compliant instruments is de facto compliant. In fact, the reason that we use multiple drafts in the first place is that the total will probably exceed our ability to verify the quantity of the whole, even if we wanted to! Going back to our examples, how could we verify, after the fact, that the 1,000 tons of grain loaded on a barge from an ABWS system with a 50,000 lb capacity scale is accurate? That's at least 40 drafts.

What becomes very clear to me in the general case is that the technical and performance requirements are applied to the individual device without regard to the summed total. It seems this summed total has always been the crux of the issue. Does this summed indication now link the three independent platforms with their independent indication in a way that makes them one device for legal purposes? This is what the S&T Committee decided in 1990. Some would continue to say yes and some would say no. However, there is the law to consider. By law, I mean the general rules of construction of legal requirements. In construction we must not be arbitrary and capricious. I believe those that say the three scales are one scale are being arbitrary and capricious.

To see how this is so, consider what UR.3.3. Single-Draft Weighing means. Below is the current HB44 text.

UR.3.3. Single-Draft Vehicle Weighing. – A vehicle or a coupled-vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination. However, the weight of:

(a) a coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results; or

(b) a vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform.

The first sentence makes it clear that this is not a general provision as it limits the scope of the requirement to "a vehicle or a coupled-vehicle combination." It now goes on to say that any entity fitting one of those two descriptions shall be weighed as a single draft. Note that this is option A from the general case above. The paragraph goes on to provide more explanation of what single-draft means.

Then we come to a "However," indicating there are viable alternatives to the single-draft requirement. Alternative (a) allows the coupled combination to be divided into sub-parts that are weighed separately and the weight of the coupled combination is found by summing the individual weights of the sub-parts. Alternative (b) says that a vehicle or a coupled combination may be suspended simultaneously on more than one scale and the weight is found by summing the indications of the multiple scales.

On first glance we might think that alternative (a) is option B from the general case, and alternative (b) is option C. However, closer reading will show that is not the case. Look carefully at the wording of alternatives (a) and (b). You cannot equate (a) with option B since (a) does not limit you to a single scale. You might assume that the multiple parts would be weighed on the same scale, but the code does not stipulate that. To do that the code would have to add the words, "on the same scale," i.e. …. weighing each unit separately on the same scale, and adding together the results; " What I'm pointing out is that (a) as it is now written allows either general option B or C. By this I am considering the case where there are multiple scales available at the site. Each of those scales might have capacity 200,000 x 20 lb. For example, think about one of those three component trucks (tractor, trailer, and pup). Alternative (a) allows you to uncouple and weigh the three sub-parts on three scales, two scales, or one scale in full compliance with the code.

Now it becomes clear that UR.3.3. is addressing the real issue with weighing large vehicles and coupled-vehicle combinations, and that is shifting loads and coupler interactions. In alternative (a) you eliminate both interferences by isolating each part on its own scale. In alternative (b) by supporting the vehicle or combination on multiple scales, any shift in the load or coupler interaction cancels out. If load shift or couple interference reduce the weight on one platform it increases it on another. Of critical importance, the three-platform scale, that is the focus of this discussion, is an application of (b) where the load is supported simultaneously on more than one platform and the individual indications of the three scales are summed to get a total. There is no other way to describe what is happening since the total indication is, in fact, a sum of the weights from the three separate platforms. Also of critical importance, there should be no expectation whatsoever that the sum valued obtained in alternative (a) will be identical to alternative (b).

However, getting back to the question about three scales or one, it should now be clear that the Handbook clearly allows summed indications from multiple devices using options B or C. If the S&T statement is correct, then the code requirements must be applied across two scales or three scales in the example of multiple scales at a site. Thus the three, one-hundred ton scales have a combined 30,000 divisions according to that interpretation. This would virtually preclude having multiple scales at the same site as they might be used to weight a single coupled-vehicle combination in pieces. Even going to 50 lb divisions still puts them out of compliance. Also, you have to consider the shift test requirements, which now require agreement of sections across all three scales!

Finally, we have to consider other cases of three independent scale platforms configured to weigh trucks. In case one, each platform has a stand-alone independent indicator and the three indications are manually summed by the operator. In case two, each platform has an individual indicator but all three indicators are housed in a single enclosure. Again the summing is done manually by the operator. In both of these cases the three independent instruments remain independent under the 1990 decision. This is what I mean by arbitrary and capricious.

Now suppose I can weigh a coupled-vehicle combination on three platforms with three separate indicators and manually add the indications to obtain a total weight for the combination. As I understand the 1990 decision, those three scales do not have to meet requirements like the number of scale divisions extended across all three scales. That extension only applies it there is a single weight display for the three scale indications and a fourth electronic indication for the sum. The results obtained are absolutely identical in function (adding manually on paper or having the system add them up) yet you are applying different requirements to the three scales depending on whether you are doing it manually or electronically. Isn't that being blatantly arbitrary and capricious?

Move over to the VTM example, and the three VTM units used to fill that order, must those three meters be treated as one meter, think about repeatability tests. It doesn't make sense for scales, nor does it make sense for any of the other codes. Thus I argue that options B and C allow the summing of multiple devices without forcing them to be considered one instrument for applying code requirements. I believe the HB needs to say that explicitly to avoid confusion.

I offer one additional item of support. I found reference that this issue has been raised internationally. Sections of the 2009 WELMEC guide to Non-automatic Weighing Instruments addresses this issue quite clearly (see pertinent sections on the final pages of this document). Point 3.1.16. in the Guide addresses the same issues as UR.3.3. where multiple platforms are used. The applications coincide with those I expressed in this discussion paper. Also I believe point 3.1.54. addresses the use of multiple axle-load scales to weigh a vehicle. It also supports the conclusion that the individual axle-load scales do not become a single instrument for compliance purposes. In extension, if 3.1.54. does not apply MPE (tolerances) to the summed indication, it also does not extend other technical requirements such as v(min) [which the NCWM has addressed], n(max), shift test, etc.

The fundamental Considerations change is necessary to spell out clearly that code requirements do not extend across multiple devices unless specifically stated. A good example is the application of the code to wheel-load weighers designated as and used in pairs. For those scales designated as pairs, many authorities apply the tolerances only the combined indication of the pair. None of the other requirements applicable to the wheel-load weigher is affected by this exception. For example, the combined number of divisions for the pair is not limited to 1,200 as in Table 3. Other requirements like identification markings, rules for indicators, zero load adjustments, etc., remain applicable only to the individual wheel-load weigher and not to the pair.

The addition to G-S.5.2.2. is necessary since you can't write requirements into the Fundamental Considerations. That section is there to help understand how to apply what is written in the Codes. You must have a specification that the electronic sum be mathematically correct to reference if there is non-compliance. That is: readings from three scales of 107, 206, and 98 must result in an electronic sum of 411.

Note 4 in Table 3 has to be changed, since the last two sentences address these instances of multiple independent scales and reflect the 1990 decision. The removal of the last sentence removes the summed indicator from consideration under the classification system as discussed above, since the summed indication is not a directly measured quantity and is not subject to class requirements. The summed indication is also not subject of requirements to n(max), tolerances, etc. When this last sentence is removed, it makes the next to last sentence unnecessary. Since each of the independent scales are already covered under the general provisions of the Table.

There is a small side issue regarding multiple devices using option C where the division size is not the same for all the devices. The general principle, i.e., that summing the indications from compliant devices is a valid way to measure a commodity, does not necessarily require that division sizes of the individual devices be identical. Note that you might want to apply UR.1.3. to printed records from the three scales. However, the new Fundamental Considerations paragraph exempts the summed indication since code requirements do not apply to the summed indication except the mathematical correctness. Also the summed indication is a sum not a representation of a scale division. It is just a sum of the values obtained from the individual compliant devices. The individual weights are also required to be shown on any record of the transaction. While the different division sizes may offend our sensibilities a little bit, on what objective basis can we say it violates the general principle, i.e. the sum of multiple compliant measurements is also de facto compliant. It is this compilation of original sources for the sum and the sum that provides the transparency for the transaction. Note the WELMEC reference indicates this is the position taken by many internationally.

I can think of another possible situation in the case of multiple ABWS systems. Suppose you are loading to a single barge from two sources where the two ABWS scales have different division sizes. The scale controller interfaced to the two scales now can print each of the weighments from each of the two scales and a single total

for the entire transaction. The sum need only be mathematically correct since it is a mathematical sum of independent, compliant weighments.

From May 2009 version of WELMEC Directive 90/384/EEC: Common Application Non-Automatic Weighing Instruments (available at www.welmec.org/latest/guides/)

3.1.2 Calculated weight (Meeting 10, Decision 10)

Where the indication represents an actual determination of the weight then the indication must respect the error allowance and be presented in the correct format.

When gross, net and tare are printed together, weight may be calculated from two actual determinations of weight. In the case of a multi-interval instrument it would be allowed to print a calculated value with the least significant digit which need not be rounded to the relevant scale interval.

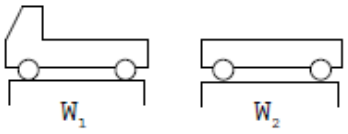
Any printout of the calculated weight values should be identified as calculated weight values.

(See also Sections 3.1.16 and 3.1.54)

3.1.16 Combined and multi-plate weighbridges (Meeting 14, Point 4, Meeting 15, Point 2 and Meeting 18, Point 9)

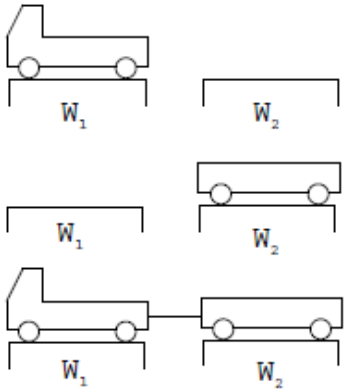
This concerns weight obtained by using adjacent weighbridges. Acceptable solutions, with examples, are shown below:

Two weighbridges, each with its own indicator:



W_1 = 30 t x 10 kg
W_2 = 30 t x 10 kg
(Two indicators; simultaneous indication necessary)
Calculated weight 60 t x 10 kg
(mpe does not apply to calculated weight)

Multi-plate weighbridge with one indicator:



W_1 = 30 t x 10 kg

W_2 = 30 t x 10 kg

W_{1+2} = 60 t x 20 kg

W_{1+2} is a weighing range (Compatibility of modules and mpe must be satisfied for it)

(See also Sections 3.1.2 and 3.1.54)

3.1.54 Vehicle weighing by summation of individual wheel load NAWIs ("axle weighers") (Meeting 25, Point 9)

If the total weight of a vehicle is calculated automatically by summing the individual weight values produced by individual wheel load NAWIs ("axle weighers"), the system is not to be regarded as being one single NAWI. The mpe does not apply to calculated weight.

(See also Sections 3.1.2 and 3.1.6)

3.1.6 Load cells

(Note that throughout this guide, "load cells" refers to analogue load cells rather than digital load cells unless stated otherwise.)

2016 NCWM Interim Meeting
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3100-1, 3200-5 and 3600-2 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3100-1 for

a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA only heard comments from the NIST/OWM. There was a concern that this would increase the tolerance applied to this type of device and may also cause conflicting tolerances. The WWMA heard new items 3100-1 and 3600-2 together. The WWMA forwarded this item to NCWM, recommending Developing status.

The CWMA Committee believes that without the addition of G-S.5.2.2.(e) this change is not relevant. CWMA did not forward this item to NCWM and recommended that it be withdrawn.

The SWMA batched items 3100-1, 3200-5 and 3600-2 together and heard comments for all at the same time. Mr. Henry Oppermann (Weights and Measures Consulting) disagrees with these items and opposes them. He recommends withdrawing all three items in this batch. Mr. Oppermann contends they violate the principles of Handbook 44. He further contends this should be on performance and not design. Mr. Oppermann concluded by stating the submitter misinterpreted the WELMEC guidelines and multiplatform truck scales used together have to function as a single scale. The Committee did not forward these items to NCWM and recommends they be Withdrawn because the proposed language is unnecessary.

NEWMA believes this item has merit; however, the Committee would like an example of how this applies to independent/multiple devices. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600-3 W Appendix D – Definitions: Batching System

Background/Discussion:
At the 2016 Annual Meeting, the Committee changed the status of this item from Voting to Informational at the request of the submitter.

Even though there are numerous batching systems in the market place and several batching systems, manual and automated, have an NTEP COC there is no definition in Handbook 44 to differentiate these systems from other types of weighing and measuring systems. Weights and Measures officials seeing a system for the first time, particularly if automated, may have difficulty in determining what section of the Scales Code to apply. This definition will assist those officials in making that determination. The SMA Handbook of Terms and Definitions Fourth Edition 1981 includes a definition for batching systems; however, for some reason that definition has never been added to Handbook 44. The definition for batching scales also has never been added even though Paragraph S.1.2. Value of Scale Division Units, makes an exception for "batching scales and weighing systems."

2016 NCWM Interim Meeting
At the 2016 NCWM Interim Meeting, the Committee agreed to group Item 320-1 and 360-3 together and receive comments simultaneously on these two items. See Item 320-1 for a summary of the comments received and Committee considerations regarding these two items.

The Committee agreed to amend the proposed definition of "batching system" by deleting the word "raw" as was done by the WWMA S&T Committee at its 2015 Annual Meeting and also proposed by the SMA. The Committee further agreed to present the item for vote as shown in "Item Under Consideration" at the Annual Meeting.

2016 NCWM Annual Meeting:
At the 2016 NCWM Annual Meeting, Mrs. Tina Butcher (OWM) indicated that the purpose of Appendix D of HB 44 is to define terms that are used in one or more of the codes in the handbook and to specify how they are intended to apply in those codes. The term "batching system" does not appear in the Scales Code of HB 44 and, therefore, it would be inappropriate to include a definition in HB 44 with a reference to that code.

She stated that the term "batching scale" does appear in HB 44; however, there is no definition in HB 44 for the term. The following definition appears in a 1975 edition of a publication titled, "Terms and Definitions for the Weighing Industry" once made available by the SMA:

> **BATCHING SCALE,** N. Any scale which, by design or construction, lends itself readily to use in proportioning admixtures by weight.

OWM does not consider a batching scale and batching system the same device given the differences in the two definitions provided. That is, the definition of the term "batching scale," from the SMA publication differs from the definition of the term "batching system," presented in the proposal.

Mrs. Butcher also indicated that OWM does not understand the purpose of the proposal, i.e., what the submitter is trying to achieve by proposing a new definition be added. If adding a definition and referencing it to the Scales Code is to recognize the existence of some automated batching systems in which the scales used in those systems return to zero-load balance after each draft load is discharged from the weighing/load-receiving element when being used in automatic operation, the Scales Code already addresses the operation of those scales. She noted that OWM had already acknowledged in earlier comments, the existence of some automated weighing systems that, by virtue of their design, fail to meet the definition of an ABWS and, therefore, the application of the ABWS Code; yet, these systems retain a heel following the discharge of the product comprised in each draft. The heel is part of the load that has failed to discharge during the discharge cycle. To determine accurately the amount of product discharged in each draft, these systems must take into account the weight of each remaining heel and subtract it from the weight indicated for its corresponding load. OWM believes the reason Kansas has submitted a proposal to update the ABWS Code (S&T Agenda Item 322-2) is to address these systems. Adding a new definition and referencing it to the Scales Code might tend to confuse some into believing such systems don't necessarily have to start each draft load from a zero-load balance condition or take into account the weight of each remaining heel, which would be a false conclusion.

She recommended that if the submitter of this proposal believes a gap exists in the Scales Code and that gap is the application of that code to some of the weighing equipment used in a particular type of batching operation, then a proposal that identifies that equipment, along with corresponding proposed requirements to be applied, should be drafted and submitted for consideration. It would be inappropriate to consider the addition of a new definition into HB 44 until a proposal supporting the inclusion of the term into the code has been submitted to the S&T Committee and adopted.

Mr. Richard Suiter (Richard Suiter Consulting, LLC) commented that the term "automated batching systems" appeared in an earlier "companion" proposal to amend the Scales Code of HB 44, but that the earlier proposal had been withdrawn by the Committee at the 2016 NCWM Interim Meeting. It was his intent in offering the two proposals, to try and differentiate between the scales used in an automated batching system from those used in other weighing applications. He pointed out that the terms "batching scales" and "weighing systems" appear in Scales Code paragraph S.1.2. and that he believes the definition being proposed would fit these terms. He indicated there was a need for HB 44 to define "batching scale" and "batching systems" and asked the Committee to consider agreeing to an Information status on the item to allow for its further development.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes the item because currently there are no specifications and tolerances defined to support the definition.

Mr. Henry Oppermann, (W&M Consulting, LLC) reported that he had submitted written comments to the Committee in opposition to the item. He stated that the proposed definition is incorrect and inappropriate based on the written comments provided.

In consideration of the comments received on this item and the submitter's request to the Committee to assign an Information status to the item to allow time for him to develop a new Scales Code proposal intended to address scales used in batching systems, the Committee agreed to maintain the item in an Information status on its agenda.

2017 NCWM Interim Meeting:
During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-1 and 3600-3 together and took comments on these items simultaneously because it considered these items related. See Agenda Item 3200-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA heard 3200-1 and 3600-3 together. The Committee did not believe the language submitted agree with goal and believe further development is needed by the source. WWMA forwarded this item to NCWM and recommended Developing status.

The CWMA S&T believes this item is fully developed and recommended Voting status.

The SWMA batched items 3200-1 and 3600-3 together and heard comments all items at the same time. Mr. Henry Oppermann (Weights and Measures Consulting) stated he was opposed to these items because they'll make it more difficult for the weights and measures official because the definition is not specific enough. These scales are "automatic bulk weighting systems" and this proposal was designed to exempt some scales from the automatic bulk weighing code. On page A12 in the S&T agenda, second paragraph, states "many are already in the marketplace, some of which have an NTEP certificate," but the submitter doesn't want to bring them into compliance with the automatic bulk weighing system code. Further, Mr. Oppermann stated this device has an unsealed parameter allowing the user to program a tolerance on the return to zero, which should not be allowed. The SWMA forwarded the item to NCWM and recommended Developing status. The SWMA asks the submitter to address why this is not covered in the bulk weighing code and present the overall picture of the items necessity.

The NEWMA S&T Committee requested clarification from Mr. Suiter (Richard Suiter Consulting) on the language for the Scales Code. The NEWMA S&T Committee believes the language is pertinent to defining a batching scale. NEWMA recommended that this be a Voting item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600-4 W Appendix D – Definitions: overregistration and underregistration (See related items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2 and 3509-1)

Background/Discussion:
The submitter provided the following comments:

> General Code paragraph **G-T.3. Application** explains that tolerances in the Handbook are expressed either in excess/in deficiency or, on overregistration/on underregistration. For the most part, one of these two formats is used in each code as applicable. Specifically, one of the Tolerance paragraphs in each Code has a specific statement along the lines of:

The tolerances hereinafter prescribed shall be applied equally to errors of underregistration and errors of overregistration.
or
The tolerances hereinafter prescribed shall be applied equally to errors in excess and errors in deficiency.

However, I was reviewing tolerances in a few codes and noticed that there were codes that were not consistent with these two formats. I am proposing the S&T Committee amend the code where necessary to make all codes consistent with G-T.3. I have identified those codes in the table below. In all cases the tolerances are clearly meant to be or overregistration/underregistration in these codes, but the text in the code either has no specified format or just describes the tolerances as positive and negative.

2.20	Scales	Not specified & positive/negative
2.21	Belt-Conveyor	Not specified
2.24	AWS	positive/negative
2.25	Weigh-in-Motion	Not specified
5.58	MDMD	Not specified
5.59	Electronic Livestock, Meat, etc.	Not specified

I note that describing tolerances as positive and negative is relative and can mean different things to different people. One person's plus can be another's minus. That is not a desirable situation. The use of "in excess," "in deficiency, "on overregistration," or "on underregistration" eliminate that ambiguity.

Note that our convention in the US is to express LMD errors as errors in delivery while most other codes we express errors in indication. G-T.3. is referring solely to errors in indication. For example, a dispenser test at 5 gal that is in error by -3 in^3 is overregistering. In contrast a scale test at 5 lb that is in error by -0.03 lb is underregistering. The distinction is most critical when the code does not apply tolerances equally to overregistration and underregistration.

It turns out the codes that do not specify the tolerance application format all apply the tolerances equally to overregistration/underregistration, so I believe these changes would be entirely editorial. I would further recommend that any "+/-" designation in the tolerance values or tables be eliminated as they are redundant and inconsistent with the principles in G-T.3.

In a related item, I believe it is necessary to bring the definition of overregistration/underregistration in line with modern measurement terminology. The definition now uses the expression "true value" in its examples. My understanding is that expression "true value" is highly discouraged mainly because no one knows what it really is. I am suggesting that we replace "true value" with "verified value" as indicated below. I opted for verified since we added the term verification to the HB44 definitions just a few years ago.

The proposed changes would make the Handbook treatment of tolerances consistent with G.T.3. It might be possible to make these changes editorially if the Committee agrees. However, because the deadline for proposals for the 2017 cycle nears, I am submitting this as a formal proposal.

2017 NCWM Interim Meeting
At the 2017 NCWM Interim Meeting, the Committee grouped Agenda Items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1, and 3600-4 together and took comments on these items simultaneously because it considered them related. See Agenda Item 3200-7 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The CWMA believes the existing language is sufficient and that this item should be withdrawn. CWMA did not forward this item to NCWM.

The SWMA batched items 3200-7, 3201-1, 3204-1, 3205-2, 3508-2, 3509-1 and 3600-4 together and heard comments for all items at the same time. Mr. Rick Kimsey (FL) stated Florida doesn't disagree with the items in the batch, but doesn't think they are necessary. He further stated that the intent is already implied in the existing codes as written and adoption of these items could lead to confusion. The SWMA did not forward these items to NCWM and recommended that they be withdrawn because the intent already exists.

The NEWMA believes this proposal has merit with making language uniform but the interpretation when applying errors of overregistration and errors of underregistration; in excess/in deficiency could lead to confusion. NEWMA forwarded the item to NCWM and recommended Developing status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600-5 D Appendix D – Definitions: Remote Configuration Capability

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

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Background / Discussion:
The Committee initially considered a proposal from the NTEP Grain Analyzer Sector to modify the definition for "remote configuration capability" as follows:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

The proposal was intended to address the use of removable digital storage devices in grain moisture meters (GGMs). Removable digital storage devices can be used in GMMs as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability in HB 44.

A USB flash drive is most likely to be used as a data transfer device. In a typical data transfer application, the USB flash drive is first connected to a computer with access to the GMM manufacturer's web site to download the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into remote configuration mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although a Secure Digital (SD) memory card could also be used as a data transfer device it is more likely to be used as a data storage device. In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations, the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card (although removable) can be considered a permanent part of the GMM in that the GMM cannot operate without it.

Note: In the above example SD memory card could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the mini size, and the micro size. A Memory Stick is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

The Committee heard opposition to the proposed changes to the definition, though a number of comments indicated support for changes to adequately address security for weighing and measuring systems adjusted using removable media. Over the course of several years, multiple proposals were presented and the Grain Analyzer Sector decided to address its concerns through implementation of other requirements specific to grain analyzers. Acknowledging the need to modify sealing requirements to better address systems adjusted using removable media, OWM requested the Committee assign responsibility for this item to OWM.

At the 2015 Annual Meeting, Tina Butcher (OWM) reported that members of its LMDP developed a draft General Code paragraph they believe will address the sealing of devices using this technology to make adjustments. The LMDP requested that this draft paragraph be included in this item to begin generating feedback to assist in further development of this item.

OWM also noted that the LMDP plans to propose modifications to a number of the individual device codes in HB 44 to reference the new General Code sealing requirement and shared an example of such proposed changes in the Scales Code.

At the 2016 Interim and Annual Meetings, Mrs. Butcher reported that OWM is continuing to develop proposed changes to individual specific code sections. OWM acknowledged the lengthy amount of time this issue has remained on the Committee's agenda and committed to developing the additional proposed changes by the 2017 Interim Meeting in order to maintain the item on the Committee's agenda. The Committee agreed to assign responsibility for this item to OWM and to allow additional time for OWM to finalize its recommendations.

See the Committee's 2013 - 2016 Final Reports for additional background information and to review the different proposals considered by the Committee to address security of equipment; the metrological parameters of which can be changed by use of some form of removable digital storage device.

2017 NCWM Interim Meeting
In January 2017, just prior to the 2017 NCWM Interim, OWM contacted the Committee to make it aware that OWM had prepared additional proposed changes that finalized the proposal. OWM asked the Committee to replace the Grain Analyzer Sector's original proposal with OWM's complete proposal (including the proposed General Code paragraph and proposed changes to specific codes.

OWM requested that this item be maintained on the Committee's 2017 agenda as either a "Developing" or "Informational" item to allow for study and comment on the proposed changes between now and the Fall 2017

regional weights and measures association meetings. At that point, after considering and incorporating any changes to the proposal, OWM would recommend that the Committee consider recommending the proposal for adoption by the NCWM in 2018.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA is opposed to this item as it currently appears on the Committee's Interim Meeting agenda. Members of the SMA haven't had the opportunity to review OWM's most recent changes and he was therefore, unable to render an opinion on the changes.

The Committee agreed to replace the Grain Analyzer Sector's original proposal with OWM's complete proposal as shown in "Item under Consideration" and assign the item a "Developing" status as recommended by OWM.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA only comment received was to keep this item Developing. WWMA agreed with this recommendation.

The CWMA believes this item has merit and supports its further development.

The SWMA received comment from Ms. Tina Butcher (OWM) that this item was originally put forward by the Grain Sector, but NIST recognized there are other devises that could be affected by this language. She stated she didn't want to change existing requirements, but wished to put forth new language from what the Grain Sector had proposed. Mrs. Butcher asked that this item remain developing until at least January. She concluded by stating that if no new language had been recommended by then the item should be withdrawn. Mr. Lou Straub (Scale Manufacturers Association) spoke in opposition of the item as printed in the agenda, but noted that the SMA would revisit any new proposed language and may change their position depending on what changes come forward. The SWMA looks forward to the continued development of this item and acknowledges the comments that the item should be withdrawn if new language has not been proposed by January 2017.

NEWMA supports the work of NIST to further develop this item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]

3600-6 V 5.XX. Transportation Network Measurement Systems – Tentative Code and Appendix D Definitions (See related item 3504-1)

Background/Discussion:
Proposed change (1):

The appearance of new types of transportation-for-hire services that use location services (such as GPS) and software applications as an interface for the user and provider of the service has created a need for regulatory standards that could be applied to these types of systems. These systems, being referred to as Transportation Network Measurement Systems (TNMS) do not use a conventional "taximeter" or other dedicated hardware devices that conform to the more traditional design of taximeters however, they provide a similar transportation-for-hire service. Regulatory officials have met with little or no success in attempts to apply existing standards (including those in Section 5.54 Taximeters Code) to TNMS due to differences in the design of these systems and other, existing types of transportation-for-hire services. The hardware components used in TNMS are devices (cellular telephones, computers, tablets) that are typically owned/possessed by the drivers and passengers using the systems and are not designed, sold, issued, or otherwise provide by the Transportation Network Companies. Since there is an absence of dedicated physical hardware used in these systems and because the primary components that are integral to the TNMS consist of various software programs, many members of the weights and measures community and transportation industry have concluded that a new documentary standard, separate from the existing Taximeters Code, is needed.

TNMS have established a large customer base in the transportation-for-hire marketplace and these systems are used extensively in the U.S. as well as internationally. There is a preponderance of public and political support to recognize and accept TNMS as fair-market competition to traditional taxi services. To that point, reasonable and appropriate standards that can be applied for the evaluation of TNMS as commercial systems must be developed and implemented. Primary goals of the implementation of a TNMS code (as well as corresponding changes to the Taximeters code) are to ensure a level playing field within this industry, ensure fair and equitable transactions, ensure transparency for consumers, and to facilitate value comparisons.

The USNWG on Taximeters has worked on the updating of the NIST HB44 Taximeters Code as well as the development of appropriate requirements for transportation systems using location services and software applications since the later portion of 2012. More recently, Transportation Network Companies (TNCs) that are the providers of TNMS have joined this effort and added their input into the standards development process. Because there are instances where taximeters are now being designed to operate using similar features and functionality as TNMS, the USNWG on Taximeters has also developed corresponding changes to the NIST HB44 Taximeters Code in an effort to provide a regulatory parity between these transportation-for-hire industry competitors. Those proposed changes to the Taximeters Code will be submitted under a separate item that already appears on the Committee's agenda (Item 3504-1 on the Committee's 2017 draft agenda) as a "carryover" item.

Proposed change (2):

Anticipating that the proposal to add a new Transportation Network Measurement Systems Code in HB44 will be adopted, there will be a corresponding need to clarify that the existing HB44, 5.54. Taximeters Code will not be applicable to these types of systems. The addition of an exemption under paragraph A.2. in the current Taximeters Code for transportation network measurement systems (TNMS) will make this clear. While this amendment to provide an exemption for TNMS in the current Taximeters Code is to be proposed also under a different agenda item (Item 3504-1, as described above), it is essential that this proposed change be a part of the TNMS item as well. This will help avoid any conflict and confusion regarding the application of the proposed tentative code should this other agenda item should a decision be made to reject or delay Item 3504-1.

Some in the weights and measures community and the transportation-for-hire industry have opposed the development of a new separate HB44 Code for TNMS stating that since those systems perform the same function as a taximeter, TNMS should be assessed based on requirements already existing in the HB44 Taximeters Code. Additional arguments that cite the lack of regulatory standards for TNMS are pointing out the loss of revenue of the traditional-type taxi services due to the increase of competition from TNMS operating in the same jurisdiction. The loss of business being reported by some in the taxi industry has also reportedly resulted in a severe decrease of the value of medallions in many areas where medallions are purchased by taxi companies as a prerequisite to operate in those particular jurisdictions.

Because these system's design and functions are considerably different from the current design of today's taximeters, there are differences between the proposed new HB44 TNMS Code and requirements that are already in (or are proposed to be added to) the existing HB44 Taximeters Code. Some may view the differences between these standards as being unfair and as providing advantages to one over the other; however, the changes that are being proposed under Item 3504-1 should bring the two codes into closer alignment. Additionally, this does not preclude the possibility of a future proposal to merge the two codes as technology evolves.

2017 NCWM Interim Meeting
At the 2017 NCWM Interim Meeting, the Committee agreed to group Agenda Items 3504-1 and 3600-6 together and take comments on these items simultaneously because it considered these items related. See Agenda Item 3504-1 for a summary of the comments received and the resulting actions taken by the Committee on these items at the 2017 NCWM Interim Meeting.

Regional Association Comments and Recommendations (Fall 2016 Conferences):
The WWMA received many comments in favor of this item from both industry and regulators. They also received a few concerns on language and made minor changes to N.1.2.2. and N.1.3.2. as shown below. As this item will need to coincide with Item 3504-1 (updated version) if passed, the WWMA recommends that they be voted upon together by NCWM. WWMA forwarded the item to NCWM and recommended that it be a voting item with the following changes:

N.1.2. Test Procedures.

N.1.2.1. Test Length. – All tests must be at least one mile in length. If a measured course or testing equipment is not readily available that will enable a test of a length sufficient to exceed the minimum fare, after completing the testing specified in N.1.1. Test Methods, an additional unmeasured test may be conducted. The purpose of this additional unmeasured test is to verify compliance with S.1.10. Receipt.

N.1.2.2. Additional Tests. – If during testing a transportation network measurement system produces a measurement that does not comply with the tolerance values in T.1.1. Distance Tests, a minimum of three additional tests ~~**shall**~~ **may** be conducted at the same location where all test variables are reduced to the greatest extent practicable to verify the system's ability to repeat transaction indications. Repeatability testing performed in excess of these three additional tests is done at the discretion of the official with statutory authority.

To verify system-wide noncompliance, tests for variability shall be conducted, including a minimum of three consecutive tests of varying lengths, locations, and/or environmental conditions.

N.1.3. Test Conditions.

N.1.3.1. General. – Except during type evaluation, all tests shall be performed under the conditions that are considered usual and customary within the location(s) where the system is normally operated as deemed necessary by the statutory authority.

N.1.3.2. Roads. – All tests shall be conducted on public roads~~**. which are in good repair**~~**.**

N.1.3.3. Testing for Environmental Influences. – During type evaluation, the distance test may include a route traveled by the vehicle that will expose the system to conditions that could contribute to the loss of, or interference with the location service's signal. This may include:

a) Objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;

b) Routes that do not follow a straight-line path;

c) Significant changes in altitude;

d) Any other relevant environmental conditions

The CWMA supports the work of the USNWG on Taximeters and believes this item is fully developed and should be included in Handbook 44 as a tentative code. CWMA forwarded the item to NCWM and recommended Voting Status.

The SWMA batched items 354-1 and 3600-6 together and heard comments for both items at the same time. Mr. Bob O'Leary (Uber) stated that the USNWG had developed a new code over the last year. He further stated that the workgroup has come to consensus with this draft code and believed it is ready for a vote. Mr. O'Leary concluded by stating he is looking forward to its adoption in July. Mr. James Cassidy (Cambridge, MA) spoke in support of these items and noted that the code is a tentative code, which needs to be adopted. Ms. Kristin Macey (CA) noted that both Mr. Cassidy and she were a part of this process within the workgroup and stated that the code has been vetted at all levels of government, in particular those that conduct taximeter testing. She further noted that this new

technology is a system and not a device. Ms. Macey concluded by stating that this new type of system must be tested using transfer standards. The SWMA believes this item is fully developed and forwarded it to NCWM, recommending Voting status.

NEWMA expressed appreciation for the hard work and many meetings of the USNWG on Taximeters. NEWMA forwarded the item to NCWM and recommended Voting status.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://www.ncwm.net/meetings/annual/publication-16 to review these documents. [Return to the Item]