

NIST Handbook 44 Proposed Requirements for Tare

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Background

- Reasons for Tare Proposals
- Review of Model W&M Law in H130
- Review of Existing Tare Requirements
- Tare Work Group
- Recently Adopted Tare Language
- Tare Proposals Still Under Consideration

Reasons for Tare Proposals

- Confusion in Terminology and Definitions
 - Differences with International Requirements
 - Different Terms for the Same Tare Functions
- Inconsistent Interpretations of G-S.2. Facilitation of Fraud
 - Increasing Difficulty in NTEP Evaluations
 - Software Developers for Accessory Devices
 - Rounding of Tare Interpretations
 - Field Enforcement
 - Accuracy of Tare
 - Rounding of Tare
 - Other Examples?

NIST Handbook 130

Model W&M Law - Review

1.1. Weight(s) and (or) Measure(s). - The term "weight(s) and (or) measure(s)" means all weights and measures of every kind, **instruments and devices for weighing and measuring, and any appliance and accessories associated with any or all such instruments and devices.**

1.8. Net "Mass" or Net "Weight." -weight . . . of a commodity **excluding any materials, substances, or items not considered to be part of the commodity.** Materials, substances, or items not considered to be part of the commodity include. . .

NIST Handbook 130

Model W&M Law - Review

Section 15. Misrepresentation of Quantity

No person shall:

- (a) take more than the represented quantity when, as buyer, he/she furnishes the weight or measure by means of which the quantity is determined, nor
- (b) sell, offer, or expose for sale a quantity less than the quantity represented, nor
- (c) represent the quantity in any manner calculated or tending to mislead or in any way deceive another person.

NIST Handbook 130

Model W&M Law - Review

Section 22. Prohibited Acts

No person shall:

- (a) use or have in possession for use in commerce any incorrect weight or measure;
- (b) sell or offer for sale for use in commerce any incorrect weight or measure;
- (c) . . .

Existing Requirements

(Other Than G-S.2. Facilitation of Fraud)

- Handbook 44 Scales Code (2008)
 - **S.2.1.6. Combined Zero-Tare ("0/T") Key**
 - **S.2.3. Tare**
 - Value
 - Operate in Backward Direction
 - Automatic Clearing of Tare
 - **S.2.3.1. Monorail Scales Equipped with Digital Indications**
 - **N.1.12. Strain-Load Test**

Existing Requirements

(Other Than G-S.2. Facilitation of Fraud)

- NCWM Publication 14
 - Over 8 Pages of Evaluation Criteria including but not limited to:
 - Multi-interval/Multiple Range Scales
 - Multiple Tare Register Memories
 - Operation- Facilitation of Fraud
 - Semiautomatic Tare
 - Keyboard/Programmable Tare
 - Pushbutton Tare
 - Digital Tare
 - Stored Tare
 - Weigh-in/Weigh-out Vehicle Scale Application
 - Percentage/Proportional Tare
 - Indication and Recorded Representations

Existing Requirements

- Publication 14 Tare Requirements are Predominantly Equivalent with OIML R76.
 - Differences Include:
 - Consistent Use of Terminology And Definitions
 - Distinction of The Two Main Types of Tare
 - Metrological
 - Preset/Predetermined
 - Specific Requirements for the Indication and Recorded Representation for Preset Tare
 - Exception for Mathematical Agreement
(Gross – Tare \neq Net) Under Specific Conditions
 - Specific Performance Tests with Tare in Effect

NTETC Weighing Sector Tare Work Group (WG)

- Established 2006 by NTETC Weighing Sector
- WG Charges:
 - Develop Recommendation for the Tare Rounding Differences Between Single Range Scales and MI/MR Scales
 - Review Tare Requirements in Pub 14 and H44
 - Develop Recommendation to Include Pub 14 Evaluation Criteria for Tare in H44

WG Recommendations for Tare Adopted into H44 Scales Code for 2009

- S.1.1.1. (c) Digital Indicating Elements. Amended to Include CZ Indication When Net Zero is $\pm 1/4d$
- S.1.2. Value of Scale Division amended to include an exception and example to d expressed other than 1, 2, or 5 for MI and MR Scale

WG Recommendations for Tare

Adopted into H44 Scales Code for 2009

- S.1.2. Value of Scale Division – Example

(Indicated and Printed)

Capacity: WR1 = 0 - 4 kg x 2 g
 WR2 = 4 - 10 kg x 5 g
 WR3 = 10 - 20 kg x 10 g

OIML R76	H44 (08)	H44 (09)	
13.380 kg	13.380 kg	13.380 kg	GROSS
<u>-3.814 kg</u>	<u>-3.810 kg*</u>	<u>-3.814 kg</u>	TARE
9.565 kg	9.570 kg	9.566 kg	NET

* 3.814 rounded to the nearest d for WR2

WG Recommendations for Tare Adopted into H44 Scales Code for 2009

- **T.N.2.1. General (Tolerances)** – The tolerance values are positive (+) and negative (-) with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference (**zero net indication**); the tolerance values apply to **the net weight indication for any possible tare load using certified test loads.**
(Amended 2008)

WG Recommendations for Tare

Adopted into H44 Scales Code for 2009

T.N.2.1. General (Tolerances) – Example

Capacity: WR1 = 0 - 4 kg x 2 g
 WR2 = 4 - 10 kg x 5 g
 WR3 = 10 - 20 kg x 10 g

<u>H44 (09)</u>	<u>Tolerance</u>
13.380 kg	GROSS ± 2 d (13.380 kg \div 0.010 kg/d = 1380 d)
<u>-3.814 kg</u>	<u>TARE</u>
9.566 kg	NET ± 2 d (9.566 kg \div 0.005 kg/d = 1913.2 d)

(Acceptable range of indication/recorded representation: 9.556 kg to 9.576 kg)

WG Recommendations for Tare

Still Under Consideration - Terminology

tare mechanism.

A tare-balancing and tare-weighing mechanism (including a tare bar) designed for determining or balancing out the weight of packaging material, containers, vehicles, or other materials that are not intended to be included in net weight determinations and for setting the net indication to zero when the tare object is on the load-receiving element (See also “preset tare,” “tare-weighing mechanism” and “tare-balancing mechanism”).

WG Recommendations for Tare

Still Under Consideration - Terminology

tare mechanism. A tare-balancing and . . .

Notes:

Reducing the weighing range for net loads is known as subtractive tare (e.g., Net Weight + Tare Weight \leq Gross Weight Capacity).

Increasing the weighing range for gross loads without altering the weighing range for net loads on mechanical scales is known as additive tare (e.g., a tare bar on a mechanical scale with a beam indicator where Net Weight + Tare Weight \geq Gross Weight Capacity).

WG Recommendations for Tare

Still Under Consideration - Terminology

tare mechanism. . . .Notes: (Continued)

The tare mechanism may function as:

- a non-automatic mechanism (load balanced or weighed by an operator),
- a semi-automatic mechanism (load balanced or weighed automatically following a single manual command), or
- an automatic mechanism where the load is balanced or weighed automatically without the intervention of an operator. An automatic tare mechanism is only suitable for indirect sales to the customer (e.g., prepackaging scales).

WG Recommendations for Tare

Still Under Consideration - Terminology

- **gross weight value.** Indication or recorded representation of the weight of a load on a weighing device, with no tare mechanism in operation.
- **net weight (net mass).** (Same as HB 130 definition)
- **net weight value.** Indication or recorded representation of the weight of a load placed on a weighing device after the operation of a tare mechanism.
- **tare.** The weight of packaging material, containers, vehicles, or other materials that are not intended to be part of the commodity included in net weight determinations.

WG Recommendations for Tare

Still Under Consideration - Terminology

- **tare-balancing mechanism.** A tare mechanism . . . *without an indication of the tare value* (weight) when the instrument is loaded. A negative net weight is assumed to be the tare value when the weighing instrument is unloaded.
 - e.g., Semiautomatic Tare on a Scale or Indicating Element, or Balancing a Weighbeam to Horizontal Position with an Ungraduated 'Tare' Beam or Balance Ball
- **tare-weighing mechanism.** A tare-balancing mechanism . . . *capable of displaying* (continuously or upon command) or printing *the (tare) value* whether or not the instrument is loaded.
 - e.g., Separate Tare Display on an Electronic Scale, or Gross/Tare Printing Slot on a TR Beam
- **tare weight value.** The weight value of a load determined by a tare mechanism.

WG Recommendations for Tare

Still Under Consideration - Terminology

- **preset tare.** A numerical value, representing a weight that is entered into a weighing device (e.g., keyboard, recalling from stored data, or entered through an interface) and is intended to be applied to weighings without determining individual tares.
- **preset tare mechanism.** A part of a weighing system for subtracting a preset tare value from a gross or net weight value and indicating the result of the calculation as a net weight. The weighing range for net loads is reduced accordingly.

WG Recommendations for Tare

Still Under Consideration - Terminology

- **Types of preset tare mechanisms include:**
 - keyboard tare
 - A numerical value manually entered through a keypad
 - digital tare
 - Repeated operation of a particular key deducts (e.g., 5 d)
 - programmable tare
 - A numerical value stored in memory as part of the PLU
 - Frequently used in ECR point-of-sale systems
 - stored tare
 - A numerical value stored in memory
 - Frequently used in vehicle and RR weighing applications

WG Recommendations for Tare

Still Under Consideration - Terminology

- Types of preset tare mechanisms include (continued):
 - percentage tare
 - A numerical value expressed as a percentage of the gross weight ($X.X\% \times \text{Gross Wt} = \text{Tare Wt}$)
 - e.g. Wrapped candy sold from bulk
 - proportional tare.
 - Different percentage of fixed tares applied to ranges of weights
 - e.g., A 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights between 2 and 4 kg, etc.)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3. Tare: The tare-weighing and tare-balancing mechanism shall operate only in a backward direction (that is, in a direction of underregistration) with respect to the zero-load balance condition of the scale. *A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated.**

[Note: On a computing scale, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a complete weighing operation, including tare, net, and gross weight determination.]*

[*Nonretroactive as of January 1, 1983]

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.1. Scale Interval (Division) and Capacity. *On any scale (except a monorail scale equipped with digital indications and multi-interval scales when the value of tare is determined in a lower weighing segment), the value of the tare-weighing division shall be equal to the value of the scale division for any given load and shall not be operable above its maximum capacity.*

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.1.2. Multi-interval Scales. – On multi-interval scales, the tare capacity is limited to the capacity of the first weighing segment and the value of the tare division shall be equal to the value of the scale division from the first weighing segment.

(Added 200X)

S.2.3.1.3. Multiple Range Scales. – On multiple range scales, the tare capacity may be operable in the greater weighing ranges if it is possible to switch to a greater weighing range with a load on the scale. The value of the tare division shall be equal to the value of the scale division from the weighing range where the tare was determined.

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.2. Accuracy. – A tare-weighing or -balancing mechanism shall permit setting the net indication to zero with an accuracy equal to or better than:

- $\pm 0.25 d$ for electronic weighing devices and any weighing device with an analog indication, and
- $\pm 0.5 d$ for mechanical weighing devices with a digital indication (e.g., weighbeams with only notched poises and no sliding poises).

On a multi-interval scale, d shall be replaced by d_1 (division value of the first weighing segment).

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.3. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word “NET” or the symbol “N”. “NET” may be displayed as “NET”, “Net” or “net”. If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the “NET” symbol shall disappear while the gross value is displayed.

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.4. Subtractive Tare Mechanism. – After any tare operation and while tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.5. Semi-automatic or Automatic* Tare-Balancing or Tare-Weighing Mechanisms. – These mechanisms shall be operable or accessible only by a tool outside of and separate from this mechanism or they shall be enclosed in a cabinet, or they shall be operable only when the indication is stable within:

(a) ± 3 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, and for all axle-load, railway track, and vehicle scales;
or

(b) ± 1 scale division for all other scales.

* Automatic tare mechanisms are not permitted for direct sales to the public.

WG Recommendations for Tare

Still Under Consideration – Specifications

- **S.2.3.6. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key).** – Scales not intended to be used in direct sales to the public may be equipped with a combined zero and tare function key, provided the device is clearly marked as to how the key functions. If the semi-automatic zero-setting mechanism and the semi-automatic tare-balancing Mechanism are operated by the same key, the following apply at any load:

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.6. (Continued)

1. After zero/tare setting, the effect of accuracy of the zero setting shall be not more than ± 0.25 d.
2. A “center-of-zero” condition shall either automatically be maintained to ± 0.25 scale division or less or have an auxiliary or supplemental “center-of-zero” indicator that defines a zero-balance condition to ± 0.25 scale division or less.
3. A zero-tracking mechanism, if equipped, shall operate only when:
 - the indication is at zero, or at a negative net value equivalent to gross zero, and
 - the weight indication is stable.

The scale must also be clearly marked on or adjacent to the weight display with the statement “Not for Direct Sales.”

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.7. Consecutive Tare Operations. –

Repeated operation of a tare mechanism (including preset tare) is permitted for single transactions with one gross, one net, and multiple tare values. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) with either “T” for tare or “PT” for preset tare as appropriate when indicated or printed.

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.7. Consecutive Tare Operations.

Can be used in transactions with any
Combination of Tare or Preset Tares

Examples:

- Multiple Net Weight Determinations
 - Recycling of different materials in a single tare container
 - Vehicle Sequentially Loaded With Mixed Commodities
- Multiple Tare Objects or Containers
 - Bins of Ag Products Loaded on to a Vehicle
 - Percentage/Proportional Tare Transactions
 - Sales of Candy from Bulk
- Other Examples?

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.8. Indication and Printing of Weighing Results.

- a) Gross weight values may be printed without any designation or by using a complete word or symbol. For a designation by a symbol, only uppercase “G” is permitted.

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.8. Indication and Printing of Weighing Results. (Continued)

- b) If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by using a complete word or symbol. The complete word “Net” or symbol “N” shall be used to designate a net weight as shown in S.2.3.3. Visibility of Operation. This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.
- c) Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.3.8. Indication and Printing of Weighing Results. (Continued)

- d) If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols “N” and “T” or by complete words using all upper-case letters, all lower-case letters, or a combination of upper- and lower-case letters.
- e) If net weight values and tare values determined by different tare mechanisms (and) are printed separately for single transactions with multiple gross, tare, and net values, they shall be suitably identified (e.g., vehicle sequentially loaded with mixed commodities).

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.4. Preset Tare Mechanism, Operation. – In addition to the provisions of paragraphs S.2.3. Tare and S.2.3.1. Scale Interval, a preset tare mechanism may be operated together with one or more tare devices provided:

- a) the preset tare mechanism complies with paragraph S.2.3.7. Consecutive Tare Operations., and
- b) the preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use,

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.4. Preset Tare Mechanism, Operation. – (Continued)

- c) the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and
- d) the preset tare values are designated by the symbol “PT”; however, it is permitted to replace the symbol “PT” with complete words.

A preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).

(Added 200X)

WG Recommendations for Tare

Still Under Consideration – Specifications

S.2.4.1. Indication of Operation. – It shall be possible to temporarily indicate the preset tare value (e.g., pressing a tare display button or by indicating a negative net weight with no load on the load-receiving element). In addition to the provisions of paragraph S.2.3.8. Indication and Printing of Weighing Results, the calculated net value is printed and at least the preset tare value is printed, with the exception of:

1. a Class II or a Class III instrument with a maximum capacity not greater than 100 kg (200 lb) used in direct sales to the public,
2. price computing scales, and
3. nonautomatic weigh/price labeling scales.

QUESTIONS?

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