

Scales

Device Description: _____

Contact Name: _____ Phone: _____

Company: _____ Address: _____

E-mail: _____ City: _____

Instructions For Completing Pre-Evaluation Checklists

You will usually need to complete **both** the “General” checklist and the specific checklist which is most applicable to your device or system type. For example, for a weighing device or weighing system the “General” checklist (which applies to all device types) and the “Scales” checklist should be completed. Both the “General” and “Watt-hour Meter” checklists should be completed and submitted with an electric watt-hour metering system application.

The exceptions are the computer software/hardware component pre-evaluation checklists which have the “General” requirements incorporated in them. Use the checklist for computer systems connected with either scales or measuring systems. Only one pre-evaluation checklist will be needed unless the software will be connected to both types of systems.

These checklists include requirements extracted from the California Code of Regulations. Though not all-encompassing, the checklists contain requirements beyond those which would apply to any single device type or accessory. It is best to think of a device type as a weighing or measuring device system or as a component of such a system whichever best describes the device(s).

When applying the requirements to your device you have three options; Check

- YES** If your device or system complies
- NO** if the device or system does not comply.
- NA** if sections appear not to apply to the device or system type(s)

If selecting “**NO**”, consider if your device or system is ready for evaluation. If the deficiency is of such a nature that it will not effect the ability to test for accuracy, such as failure to conform with marking requirements or lack of provision for sealing, the evaluation can probably begin while deficiencies are being corrected.

If you are not able to conduct accuracy testing your system or device is probably not yet ready for an evaluation.

I have reviewed the enclosed specifications, tolerances, and test notes for the device type for which we have applied for evaluation and approval. To the best of my knowledge I have determined the device meets all applicable requirements.

Signed: _____

Date: _____

Scales

<p>A. Application.</p> <p>A.1. General. - This code applies to all types of weighing devices other than automatic bulk-weighing systems and belt-conveyor scales. The code comprises requirements that are generally applicable to all weighing devices, and specific requirements that are applicable only to certain types of weighing devices.</p> <p>A.2. Wheel-Load Weighers, Portable Axle-Load Weighers, and Axle-Load Scales. - The requirements for wheel-load weighers, portable axle-load weighers, and axle-load scales apply only to such scales in official use for the enforcement of traffic and highway laws or for the collection of statistical information by government agencies.</p>

	Yes	No	NA
<p>S. Specifications.</p> <p>S.1. Design of Indicating and Recording Elements and of Recorded Representations.</p> <p>S.1.1. Zero Indication.</p> <p>(a) On a scale equipped with indicating or recording elements, provision shall be made to either indicate or record a zero-balance condition.</p> <p>(b) On an automatic-indicating scale or balance indicator, provision shall be made to indicate or record an out-of-balance condition on both sides of zero.</p> <p>(c) A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that an effective automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition.</p>			
<p>S.1.1.1. Digital Indicating Elements.</p> <p>(a) A digital zero indication shall represent a balance condition that is within $\pm 1/2$ the value of the scale division.</p> <p>(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to $\pm 1/4$ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to $\pm 1/4$ of a scale division or less.</p>			
<p>S.1.1.2. No-Load Reference Value. - On a single draft manually operated receiving hopper scale installed below grade, used to receive grain, and utilizing a no-load reference value, provision shall be made to indicate and record the no-load reference value prior to the gross load value.</p>			
<p>S.1.2. Value of Scale Division Units. - <i>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:</i></p> <p>(a) 1, 2, or 5; or</p> <p>(b) a decimal multiple or submultiple of 1, 2, or 5; or</p> <p style="padding-left: 20px;"><i>Examples: scale divisions may be 10, 20, 50, or 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.</i></p> <p>(c) a binary submultiple of a specific unit of weight.</p> <p style="padding-left: 20px;"><i>Examples: scale divisions may be 1/2, 1/4, 1/8, 1/16, etc.</i></p>			

Scales

	Yes	No	NA
<p>S.1.2.1. Weight Units. - Except for postal scales, a digital-indicating scale shall indicate weight values using only a single unit of measure. Weight values shall be presented in a decimal format with the value of the scale division expressed as 1, 2, or 5, or a decimal multiple or submultiple of 1, 2, or 5.</p>			
<p>S.1.2.2. Verification Scale Interval.</p> <p>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 by the expression:</p> $d < e \leq 10 d$ <p>If the displayed division (d) is less than the verification division (e), then the verification division shall be less than or equal to 10 times the displayed division.</p> <p>The value of e must satisfy the relationship, $e = 10^k$ of the unit of measure, where k being a positive or negative whole number or zero. This requirement does not apply to a Class I device with $d < 1$ mg where $e = 1$ mg. If $e \neq d$, the value of "d" shall be a decimal submultiple of "e," and the ratio shall not be more than 10:1. If $e \neq d$, and both "e" and "d" are continuously displayed during normal operation, then "d" shall be differentiated from "e" by size, shape, color, etc., throughout the range of weights displayed as "d."</p>			
<p>S.1.2.2.2. Class III and IIII. - 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."</p>			
<p>S.1.2.3. Prescription Scale with a Counting Feature. – A Class I or Class II prescription scale with an operational counting feature shall not calculate a piece weight or total count unless the sample used to determine the individual piece weight meets the following conditions:</p> <p>(a) minimum individual piece weight is greater than or equal to 3 e; and</p> <p>(b) minimum sample piece count is greater than or equal to 10 pieces.</p>			
<p>S.1.7. Capacity Indication, Weight Ranges, and Unit Weights.</p> <p>(a) Gross Capacity. An indicating or recording element shall not display nor record any values when the total platform load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 percent of scale capacity.</p> <p>(b) Capacity Indication. Electronic computing scales (excluding postal scales and weight classifiers) shall neither display nor record a gross or net weight in excess of scale capacity plus 9d.</p> <p>The total value of weight ranges and of unit weights in effect or in place at any time shall automatically be accounted for on the reading face and on any recorded representation.</p> <p>This requirement does not apply to: (1) single-revolution dial scales, (2) multi-revolution dial scales not equipped with unit weights, (3) scales equipped with two or more weighbeams, nor (4) devices that indicate mathematically derived totalized values.</p>			

Scales

	Yes	No	NA
<p>S.1.8. Computing Scales.</p> <p>S.1.8.1.M. Money-Value Graduations, Metric Unit Prices. - The value of the graduated intervals representing money values on a computing scale with analog indications shall not exceed:</p> <p>(a) 1 cent at all unit prices of 55 cents per kilogram and less; (b) 2 cents at unit prices of 56 cents per kilogram through \$2.75 per kilogram (special graduations defining 5-cent intervals may be employed but not in the spaces between regular graduations); (c) 5 cents at unit prices of \$2.76 per kilogram through \$7.50 per kilogram; or (d) 10 cents at unit prices above \$7.50 per kilogram.</p> <p>Value figures and graduations shall not be duplicated in any column or row on the graduated chart.</p>			
<p>S.1.8.1. Money-Value Graduations, Inch-Pound Unit Prices. - The value of the graduated intervals representing money values on a computing scale with analog indications shall not exceed:</p> <p>(a) 1 cent at all unit prices of 25 cents per pound and less; (b) 2 cents at unit prices of 26 cents per pound through \$1.25 per pound (special graduations defining 5-cent intervals may be employed but not in the spaces between regular graduations); (c) 5 cents at unit prices of \$1.26 per pound through \$3.40 per pound; or (d) 10 cents at unit prices above \$3.40 per pound.</p> <p>Value figures and graduations shall not be duplicated in any column or row on the graduated chart.</p>			
<p>S.1.8.2. Money-Value Computation. - A computing scale with analog quantity indications used in retail trade may compute and present digital money values to the nearest quantity graduation when the value of the minimum graduated interval is 0.005 kg (0.01 lb) or less.</p>			
<p>S.1.8.3.1. Scales that will function as either a normal round off scale or as a weight classifier shall be provided with a sealable means for selecting the mode of operation and shall have a clear indication (annunciator), adjacent to the weight display on both the operator's and customer's side whenever the scale is operating as a weight classifier.</p>			
<p>S.1.8.4. 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:</p> <p>(a) the net weight; (b) the unit price; (c) the total price; and (d) the product class or, in a system equipped with price look-up capability, the product name or code number.</p>			

Scales

	Yes	No	NA
<p>S.1.10. Adjustable Components. - An adjustable component such as a pendulum, spring, or potentiometer shall be held securely in adjustment and, except for a zero-load balance mechanism, shall be located within the housing of the element.</p>			
<p>S.1.11. Provision for Sealing.</p> <p>(a) <i>Except on Class I scales, 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.</i></p> <p>(b) <i>Except on Class I scales, 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.</i></p> <p>(c) <i>Except on Class I scales, audit trails shall use the format set forth in Table S.1.11 (see page 22).</i></p> <p>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.</p>			
<p>S.1.12. Manual Weight Entries. - A device when being used for direct sale shall accept an entry of a manual gross or net weight value only when the scale gross or net* weight indication is at zero. Recorded manual weight entries, except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: "Manual Weight," "Manual Wt," or "MAN WT." The use of a symbol to identify multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.</p>			
<p>S.1.13. Vehicle On-Board Weighing Systems: Vehicle in Motion. - When the vehicle is in motion, a vehicle on-board weighing system shall either:</p> <p>(a) be accurate, or (b) inhibit the weighing operation.</p>			
<p>S.2. Design of Balance, Tare, Level, Damping, and Arresting Mechanisms.</p> <p>S.2.1. Zero-Load Adjustment.</p> <p>S.2.1.1. General. - A scale shall be equipped with means by which the zero-load balance may be adjusted. Any loose material used for this purpose shall be enclosed so that it cannot shift in position and alter the balance condition of the scale.</p>			

Scales

	Yes	No	NA
<p>S.2.1.2. Scales Used in Direct Sales. - A manual zero-setting mechanism (except on a digital scale with an analog zero-adjustment mechanism with a range of not greater than one scale division) shall be operable or accessible only by a tool outside of and entirely separate from this mechanism, or it shall be enclosed in a cabinet. Except on Class I or II scales, a balance ball shall either meet this requirement or not itself be rotatable.</p> <p>A semiautomatic zero-setting mechanism shall be operable or accessible only by a tool outside of and separate from this mechanism or it shall be enclosed in a cabinet, or it shall be operable only when the indication is stable within:</p> <p>(a) plus or minus 3 scale divisions for scales of more than 2 000 kg (5 000 lb) capacity in service prior to January 1, 1981, and for all axle-load, railway track, and vehicle scales; or (b) plus or minus 1 scale division for all other scales.</p>			
<p>S.2.1.3. Scales Equipped With An Automatic Zero-Setting Mechanism (Zero Tracking).</p> <p>S.2.1.3.1. Zero-Tracking for Scales Manufactured Between January 1, 1981 and January 1, 2007. – The maximum load that can be "rezeroed," when either placed on or removed from the platform all at once under normal operating conditions, shall be:</p> <p>(a) for bench, counter, and livestock scales: 0.6 scale division; (b) for vehicle, axle-load, and railway track scales: 3.0 scale divisions; and (c) for all other scales: 1.0 scale division.</p>			
<p>S.2.1.3.2. Zero-Tracking for Scales Manufactured On Or After January 1, 2007. – The maximum load that can be "rezeroed," when either placed on or removed from the platform all at once under normal operating conditions, shall be:</p> <p>(a) for vehicle, axle-load, and railway track scales: 3.0 scale divisions; and (b) for all other scales: 0.5 scale division.</p>			
<p>S.2.1.3.3. Means to Disable Zero-Tracking On Class III L Devices. - Class III L devices equipped with a zero-tracking mechanism shall be designed with a sealable means that would allow zero-tracking to be disabled during the inspection and test of the device.</p>			
<p>S.2.1.5. Initial Zero-Setting Mechanism.</p> <p>(a) Scales of accuracy Classes I, II, and III may be equipped with an initial zero-setting device. (b) An initial zero-setting mechanism shall not zero a load in excess of 20 percent of the maximum capacity of the scale unless tests show that the scale meets all applicable tolerances for any amount of initial load compensated by this device within the specified range.</p>			
<p>S.2.1.6. Combined Zero-Tare ("O/T") Key. - Scales not intended to be used in direct sales applications may be equipped with a combined zero and tare function key, provided that the device is clearly marked as to how the key functions. The device must also be clearly marked on or adjacent to the weight display with the statement "Not for Direct Sales."</p>			

Scales

	Yes	No	NA
<p>S.2.2.1. Dairy-Product-Test, Grain-Test, Prescription, and Class I and II Scales. - Except on digital indicating devices, a dairy-product-test, grain-test, prescription, or Class I or II scale shall be equipped with a balance indicator. If an indicator and a graduated scale are not in the same plane, the clearance between the indicator and the graduations shall be not more than 1.0 mm (0.04 in).</p>			
<p>S.2.3. Tare. - <i>On any scale (except a monorail scale equipped with digital indications), the value of the tare division shall be equal to the value of the scale division.</i> The tare mechanism shall operate only in a backward direction (that is, in a direction of under-registration) with respect to the zero-load balance condition of the scale. <i>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.</i></p> <p><i>[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.]</i></p>			
<p>S.2.4. Level-Indicating Means. - Except for portable wheel- load weighers and portable axle-load scales, a portable scale shall be equipped with level-indicating means if its weighing performance is changed by an amount greater than the appropriate acceptance tolerance when it is moved from a level position and rebalanced in a position that is out-of-level in any upright direction by 5 percent (approximately 3 degrees). The level-indicating means shall be readable without removing any scale parts requiring a tool.</p>			
<p>S.2.4.1. Vehicle On-Board Weighing Systems. - A vehicle on-board weighing system shall operate within tolerance when the weighing system is out-of-level up to 3 degrees or 5 percent. If the accuracy of the system is affected by out-of-level conditions normal to the use of the device, the system shall be equipped with an out-of-level sensor that inhibits the weighing operation when the system is out-of-level to the extent that the accuracy limits are exceeded.</p>			
<p>S.2.5. Damping Means. - An automatic-indicating scale and a balance indicator shall be equipped with effective means to damp oscillations and to bring the indicating elements quickly to rest.</p>			
<p>S.2.5.1. Digital Indicating Elements. - Digital indicating elements equipped with recording elements shall be equipped with effective means to permit the recording of weight values only when the indication is stable within:</p> <p>(a) Plus or minus 3 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, hopper (other than grain hopper) scales with a capacity exceeding 22 000 kg (50 000 lb), and for all vehicle, axle load, livestock, and railway track scales.</p> <p>(b) Plus or minus 1 scale division for all other scales.</p> <p>The values recorded shall be within applicable tolerances.</p>			
<p>S.2.5.2. Jewelers', Prescription, and Class I and Class II Scales. - A jewelers', prescription, Class I, or Class II scale shall be equipped with appropriate means for arresting the oscillation of the mechanism.</p>			

Scales

	Yes	No	NA
S.2.5.3. Class I and Class II Prescription Scales with a Counting Feature. – A Class I or Class II prescription scale shall indicate to the operator when the piece weight computation is complete by a stable display of the quantity placed on the load receiving element.			
S.3. Design of Load-Receiving Elements.			
S.3.2. Drainage. - A load-receiving element intended to receive wet commodities shall be so constructed as to drain effectively.			
S.3.3. Scoop Counterbalance. - A scoop on a scale used for direct sales to retail customers shall not be counterbalanced by a removable weight. A permanently attached scoop-counterbalance shall indicate clearly on both the operator's and customer's sides of the scale whether it is positioned for the scoop to be on or off the scale.			
S.4. Design of Weighing Elements.			
S.4.1. Antifriction Means. - Frictional effects shall be reduced to a minimum by suitable antifriction elements. Opposing surfaces and points shall be properly shaped, finished, and hardened. A platform scale having a frame around the platform shall be equipped with means to prevent interference between platform and frame.			
S.4.2. Adjustable Components. - An adjustable component such as a nose-iron or potentiometer shall be held securely in adjustment. The position of a nose-iron on a scale of more than 1 000-kg (2 000-lb) capacity, as determined by the factory adjustment, shall be accurately, clearly, and permanently defined.			
S.4.3. Multiple Load-Receiving Elements. - Except for mechanical bench and counter scales, a scale 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.5. Design of Weighing Devices, Accuracy Class.			
S.5.1. Designation of Accuracy Class. - Weighing devices are divided into accuracy classes and shall be designated as I, II, III, III L, or IIII.			
S.5.2. Parameters for Accuracy Class. - The accuracy class of a weighing device is designated by the manufacturer and shall comply with parameters shown in Table 3 (see page 26).			
S.5.3. Multi-Interval and Multi-Range Scales, Division Value. - On a multi-interval scale and multiple range scale, the value of "e" shall be equal to the value of "d."			

Scales

	Yes	No	NA
<p>S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division. - The relationship of the value for the load cell verification scale interval, v_{min}, to the scale division, d, for a specific scale installation using NTEP load cells shall comply with the following formulae where N is the number of load cells in the scale (such as hopper or vehicle scale weighing/load-receiving elements):</p> <p>(a) $v_{min} \leq \frac{d^*}{\sqrt{N}}$ for scales without lever systems; and</p> <p>(b) $v_{min} \leq \frac{d^*}{\sqrt{N} \times (\text{scale multiple})}$ for scales with lever systems</p> <p>[* When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae above.]</p> <p>This requirement does not apply to complete weighing/load-receiving elements or scales which satisfy all the following criteria:</p> <ul style="list-style-type: none"> - The complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the National Type Evaluation Program (NTEP); - the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and - the complete weighing/load-receiving element or scale is equipped with an automatic zero-tracking mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode. 			
<p>S.6. Marking Requirements.</p> <p>S.6.1. Nominal Capacity; Vehicle and Axle-Load Scales. - For all vehicle and axle-load scales, the marked nominal capacity shall not exceed the concentrated load capacity (CLC) times the quantity of the number of sections in the scale minus 0.5.</p> <p>As a formula, this is stated as</p> $\text{nominal capacity} \leq \text{CLC} \times (N - 0.5)$ <p>where N = the number of sections in the scale.</p> <p>[Note: When the device is used in a combination railway track and vehicle weighing application, the above formula shall apply only to the vehicle scale application.]</p>			
<p>S.6.2. Location of Marking Information. - Scales that are not permanently attached to an indicating element, and for which the load-receiving element is the only part of the weighing/load-receiving element visible after installation, may have the marking information required located in an area that is accessible only through the use of a tool; provided that the information is easily accessible (e.g., the information may appear on the junction box under an access plate). The identification information for these scales shall be located on the weighbridge (load-receiving element) near the point where the signal leaves the weighing element or beneath the nearest access cover.</p>			

Scales

	Yes	No	NA
<p>S.6.3. Scales, Main Elements, and Components of Scales or Weighing Systems. - Scales, main elements of scales when not contained in a single enclosure for the entire scale, load cells for which Certificates of Conformance (CC) have been issued under the National Type Evaluation Program, and other equipment necessary to a weighing system, but having no metrological effect on the weighing system, shall be marked as specified in Table S.6.3.a. (see page 23) and explained in the accompanying notes [Table S.6.3.b (see page 24 & 25)].</p>			
<p>S.6.4. Railway Track Scales. - A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. <i>The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two-section scale shall not exceed its rated section capacity.</i></p>			
<p>S.6.5. Livestock Scales. - A livestock scale manufactured prior to January 1, 1989 or after January 1, 2003 shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Livestock scales manufactured between January 1, 1989 and January 1, 2003 shall be marked with either the Concentrated Load Capacity (CLC) or the Section Capacity. Such marking shall be accurately and conspicuously presented on, or adjacent to the identification or nomenclature plate that is attached to the indicating element of the scale. <i>The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two-section scale shall not exceed its rated section capacity.</i> See also Note 14 in Table S.6.3.b.</p>			
<p>S.6.6. Counting Feature, Minimum Individual Piece Weight and Minimum Sample Piece Count. – A Class I or Class II prescription scale with an operational counting feature shall be marked with the minimum individual piece weight and minimum number of pieces used in the sample to establish an individual piece weight.</p>			
<p>N. Notes.</p> <p>N.1. Test Procedures.</p> <p>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, 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.</p>			
<p>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.</p>			
<p>N.1.2.1. Scales Marked I, II, III, or IIII. - Except for portable wheel load weighers, decreasing-load tests shall be conducted on scales marked I, II, III, or IIII and with n equal to or greater than 1000 with test loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, at test loads equal to 4000d, 2000d, and 500d; for scales with n less than 1000, the test load shall be equal to one-half of the maximum load applied in the increasing-load test.</p>			

Scales

	Yes	No	NA
<p>N.1.2.2. All Other Scales. - On all other scales, except for portable wheel load weighers, the decreasing-load test shall be conducted with a test load equal to one-half of the maximum load applied in the increasing-load test.</p>			
<p>N.1.3. Shift Test.</p> <p>N.1.3.1. Bench or Counter Scales. - A shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.</p>			
<p>N.1.3.2. Dairy-Product-Test Scales. - A shift test shall be conducted with a test load of 18 grams successively positioned at all points on which a weight might reasonably be placed in the course of normal use of the scale.</p>			
<p>N.1.3.3. Equal-Arm Scales. - A shift test shall be conducted with a half-capacity test load positioned on each pan as prescribed in N.1.3.1. An equal test load shall be centered on the other pan.</p>			
<p>N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales.</p> <p>N.1.3.4.1. Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales.</p> <p>(a) Minimum Shift Test. At least one shift test shall be conducted with a minimum test load of 12.5% of scale capacity, which may be performed anywhere on the load-receiving element using the prescribed test patterns and maximum test loads specified below. (Combination Vehicle/Livestock Scales shall also be tested consistent with N.1.3.4.2.)</p> <p>(b) Prescribed Test Pattern and Loading for Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales. The normal prescribed test pattern shall be an area of 1.2 m (4 ft) in length and 3.0 m (10 ft) in width or the width of the scale platform, whichever is less. Multiple test patterns may be utilized when loaded in accordance with paragraph (c) (d), or (e) as applicable. An example of a possible test pattern is shown in the diagram below.</p> <div style="text-align: center;"> <p>The diagram illustrates a horizontal line representing a 12-foot test pattern. It is divided into five segments, each labeled '4'' above it. The segments are: a solid grey rectangle labeled 'Section 1', a white rectangle labeled 'Midway between sections 1 and 2', a solid grey rectangle labeled 'Section 2', a white rectangle labeled 'Midway between sections 2 and 3', and a solid grey rectangle labeled 'Section 3'.</p> </div>			

Scales

	Yes	No	NA
<p>(c) Loading Precautions for Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales. When loading the scale for testing, one side of the test pattern shall be loaded to no more than half of the concentrated load capacity or test load before loading the other side. The area covered by the test load may be less than 1.2 m (4 ft) x 3.0 m (10 ft) or the width of the scale platform; whichever is less; for test patterns less than 1.2 m (4 ft) in length the maximum loading shall meet the formula: [(wheel base of test cart or length of test load divided by 48 in) x 0.9 x CLC]. The maximum test load applied to each test pattern shall not exceed the concentrated load capacity of the scale. When the test pattern exceeds 1.2 m (4 ft), the maximum test load applied shall not exceed the concentrated load capacity times the largest “r” factor in Table UR.3.2.1. for the length of the area covered by the test load. For load-receiving elements installed prior to January 1, 1989, the rated section capacity may be substituted for concentrated load capacity to determine maximum loading. An example of a possible test pattern is shown above.</p> <p>(d) Multiple Pattern Loading. To test the nominal capacity, multiple patterns may be simultaneously loaded in a manner consistent with the method of use.</p> <p>(e) Other Designs. Special design scales and those that are wider than 3.7 m (12 ft) shall be tested in a manner consistent with the method of use but following the principles described above.</p>			
<p>N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. – A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)</p> <div style="text-align: center;"> <p>○ = Load Bearing Point</p> </div>			

Scales

	Yes	No	NA
<p>N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. - A shift test shall be conducted using the following prescribed test loads and test patterns. For livestock scales, the shift test load shall not exceed one-half the rated section capacity or one-half the rated concentrated load capacity, whichever is applicable. A shift test shall be conducted using either:</p> <p>(a) A one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in the diagram below; or</p> <div data-bbox="388 604 1029 984" data-label="Diagram"> </div> <p>○ = Load Bearing Point</p> <p>(b) A one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in the diagram below.</p> <div data-bbox="365 1163 1040 1566" data-label="Diagram"> </div> <p>○ = Load Bearing Point</p>			
<p>N.1.5. Discrimination Test. - A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at or near zero load and at or near maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained. For scales equipped with an Automatic Zero-Setting Mechanism (AZSM), the discrimination test may be conducted at a range outside of the AZSM range.</p>			

Scales

	Yes	No	NA
N.1.5.1. Digital Device. - On a digital device, this test is conducted from just below the lower edge of the zone of uncertainty for increasing load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.			
N.1.6. RFI Susceptibility Tests, Field Evaluation. - An RFI test shall be conducted at a given installation when the presence of RFI has been verified and characterized if those conditions are considered "usual and customary."			
N.1.7. Ratio Test. - A ratio test shall be conducted on all scales employing counterpoise weights and on nonautomatic-indicating equal-arm scales.			
N.1.8. Material Tests. - A material test shall be conducted on all customer-operated bulk weighing systems for recycled materials using bulk material for which the device is used. Insert into the device, in a normal manner, several accurately preweighed samples (free of foreign material) in varying amounts approximating average drafts.			
N.1.9. Zero-Load Balance Change. - A zero-load balance change test shall be conducted on all scales after the removal of any test load. The zero-load balance should not change by more than the minimum tolerance applicable.			
<p>N.1.10. Counting Feature Test. – A test of the counting function shall be conducted on all Class I and Class II prescription scales having an active counting feature used in “legal for trade” applications. The test should verify that the scale will not accept a sample with less than either the minimum sample piece count or the minimum sample weight of 30 e. Counting feature accuracy should be verified at a minimum of two test loads. Verification of the count calculations shall be based upon the weight indication of the test load.</p> <p>Note:</p> <p>(1) The minimum sample weight is equal to the marked minimum individual piece weight times the marked minimum sample piece count.</p> <p>(2) Test load as used in this section refers to actual calibration test weights selected from an appropriate test weight class.</p>			
N.1.11. Substitution Test. – In the substitution test procedure, material or objects are substituted for known test weights, or a combination of known test weights and previously quantified material or objects, using the scale under test as a comparator. Additional test weights or other known test loads may be added to the known test load to evaluate higher weight ranges on the scale.			
N.1.12. Strain-Load Test. – In the strain load test procedure, an unknown quantity of material or objects are used to establish a reference load or tare to which test weights or substitution test loads are added.			
N.2. Verification (Testing) Standards. - Field standard weights used in verifying weighing devices shall comply with requirements of National Institute of Standards and Technology Handbook 105-1 (Class F) or the tolerances expressed in Fundamental Considerations, paragraph 3.2 (i.e., one-third of the smallest tolerance applied).			

Scales

	Yes	No	NA
N.6. Nominal Capacity of Prescription Scales. - The nominal capacity of a prescription scale shall be assumed to be 1/2 apothecary ounce, unless otherwise marked. (Applicable only to scales not marked with an accuracy class.)			
T. Tolerances Applicable to Devices <u>not</u> Marked I, II, III, III L, or IIII;			
T.1. Tolerance Values.			
T.1.1. General. - The tolerances applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table T.1.1.			
T.1.2. Postal and Parcel Post Scales. - The tolerances for postal and parcel post scales are given in Table T.1.1 and Table 5			
T.4. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. - The difference between the weight indication with the disturbance and the weight indication without the disturbance, shall not exceed one scale division (d) or the equipment shall: (a) blank the indication; or (b) provide an error message; or (c) the indicator shall be so completely unstable that it could not be interpreted; or transmitted into memory or to a recording element, as a correct measurement value.			
T.5. Operating Temperature. - <i>An indicating or recording element shall not display or record any usable values until the operating temperature necessary for accurate weighing and a stable zero-balance condition has been attained.</i>			
T.N. Tolerances Applicable to Devices Marked I, II, III, III L, & IIII.			
T.N.1. Principles.			
T.N.1.1. Design. - The tolerance for a weighing device is a performance requirement independent of the design principle used.			
T.N.1.2. Accuracy Classes. - Weighing devices are divided into accuracy classes according to the number of scale divisions (n) and the value of the scale division (d).			
T.N.1.3. Scale Division. - The tolerance for a weighing device is related to the value of the scale division (d) or the value of the verification scale division (e) and is generally expressed in terms of d or e.			
T.N.2. Tolerance Application.			
T.N.2.1. General. - 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; the tolerance values apply to certified test loads only.			
T.N.2.2. Type Evaluation Examinations. - For type evaluation examinations, the tolerance values apply to increasing and decreasing load tests within the temperature, power supply, and barometric pressure limits specified in T.N.8.			

Scales

	Yes	No	NA
T.N.2.3. Subsequent Verification Examinations. - For subsequent verification examinations, the tolerance values apply regardless of the influence factors in effect at the time of the conduct of the examination.			
T.N.2.4. Multi-Interval and Multiple Range (Variable Division-Value) Scales. - For multi-interval and multiple range scales, the tolerance values are based on the value of the scale division of the range in use.			
T.N.2.5. Ratio Tests. - For ratio tests, the tolerance values are 0.75 of the applicable tolerances.			
T.N.3. Tolerance Values.			
T.N.3.1. Maintenance Tolerance Values. - The maintenance tolerance values are as specified in Table 6 (see page 27).			
T.N.3.2. Acceptance Tolerance Values. - The acceptance tolerance values shall be one-half the maintenance tolerance values.			
T.N.3.3. Wheel-Load Weighers and Portable Axle-Load Weighers of Class III. - The tolerance values are two times the values specified in T.N.3.1. and T.N.3.2.			
T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales. - The maintenance and acceptance tolerances shall be as specified in T.N.3.1. and T.N.3.2. for Class III L, except that the tolerance for crane and construction materials hopper scales shall not be less than 1d or 0.1 percent of the scale capacity, whichever is less.			
T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc. - If a main element separate from a weighing device is submitted for type evaluation, the tolerance for the element is 0.7 that for the complete weighing device. This fraction includes the tolerance attributable to the testing devices used.			
T.N.3.9. Materials Test on Customer-Operated Bulk Weighing Systems for Recycled Materials. - The maintenance and acceptance tolerance shall be ± 5 percent of the applied materials test load except that the average error on 10 or more test materials test loads shall not exceed ± 2.5 percent.			
T.N.3.10. Prescription Scales with a Counting Feature. In addition to Table 6 Maintenance Tolerances (for weight), the indicated piece count value computed by a Class I or Class II prescription scale counting feature shall comply with the tolerances in Table T.N.3.10.			

Table T.N.3.10. Maintenance and Acceptance Tolerances in Excess and in Deficiency for Count	
Indication of Count	Tolerance (piece count)
0 to 100	0
101 to 200	1
201 or more	0.5%

Scales

	Yes	No	NA
T.N.3.11. Tolerances for Substitution Test. – Tolerances are applied to the scale based on the substitution test load.			
T.N.3.12. Tolerances for Strain-Load Test. – Tolerances apply only to the test weights or substitution test loads.			
T.N.4. Agreement of Indications.			
T.N.4.1. Multiple Indicating/Recording Elements. - In the case of a scale or weighing system equipped with more than one indicating element or indicating element and recording element combination, where the indicators or indicator/recorder combination are intended to be used independently of one another, tolerances shall be applied independently to each indicator or indicator/recorder combination.			
T.N.4.2. Single Indicating/Recording Element. - In the case of a scale or weighing system with a single indicating element or an indicating/recording element combination and equipped with component parts such as unit weights, weighbeam and weights, or multiple weighbeams that can be used in combination to indicate a weight, the difference in the weight value indications of any load shall not be greater than the absolute value of the applicable tolerance for that load, and shall be within tolerance limits.			
T.N.4.3. Single Indicating Element/Multiple Indications. - In the case of an analog indicating element equipped with two or more indicating means within the same element, the difference in the weight indications for any load other than zero shall not be greater than one-half the value of the scale division (d) and be within tolerance limits.			
T.N.4.4. Shift or Section Tests. - The range of the results obtained during the conduct of a shift test or a section test shall not exceed the absolute value of the maintenance tolerance applicable and each test result shall be within applicable tolerances.			
T.N.4.5. Time Dependence. – A time dependence test shall be conducted during type evaluation and may be conducted during field verification provided test conditions remain constant.			
T.N.4.5.1. Time Dependence; Class II, III, and IIII Non-Automatic Weighing Instruments. A non-automatic weighing instrument of Classes II, III, and IIII shall meet the following requirements at constant test conditions. During type evaluation, this test shall be conducted at 20 °C ± 2 °C (68 °F ± 4 °F): (a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed 0.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.2 e. (b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied. (c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed 0.5 e.			

Scales

	Yes	No	NA
<p>For a multi-interval instrument, the deviation shall not exceed $0.5 e_1$ (where e_1 is the interval of the first partial weighing range or segment of the scale).</p> <p>On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed $0.5 e_i$ (interval of the weighing segment). Furthermore, after returning to zero from any load greater than Max_1 (capacity of the first weighing range) and immediately after switching to the lowest weighing range, the indication near zero shall not vary by more than e_1 (interval of the first weighing range) during the following 5 minutes.</p>			
<p>T.N.4.5.2. Time Dependence; Class III L Non-Automatic Weighing Instruments. - A non-automatic weighing instrument of Class III L shall meet the following requirements:</p> <p>(a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed $1.5 e$. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed $0.6 e$.</p> <p>(b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied.</p> <p>(c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed one-half of the absolute value of the applicable tolerance for the applied load for Class III L devices.</p>			
<p>T.N.4.6. Time Dependence (Creep) for Load Cells During Type Evaluation. – A load cell (force transducer) marked with an accuracy class shall meet the following requirements at constant test conditions:</p> <p>(a) Permissible Variations of Readings. - With a constant maximum load for the measuring range (D_{max}) between 90% and 100% of maximum capacity (E_{max}), applied to the load cell, the difference between the initial reading and any reading obtained during the next 30 minutes shall not exceed the absolute value of the maximum permissible error (mpe) for the applied load (see Table T.N.4.6. on page 27). The difference between the reading obtained at 20 minutes and the reading obtained at 30 minutes shall not exceed 0.15 times the absolute value of the mpe (see Table T.N.4.6.).</p> <p>(b) Apportionment Factors. - The mpe for creep shall be determined from Table T.N.4.6. Maximum Permissible Error (mpe)* for Load Cells During Type Evaluation using the following apportionment factors (p_{LC}):</p> <p style="margin-left: 40px;">$p_{LC} = 0.7$ for load cells marked with S (single load cell applications), $p_{LC} = 1.0$ for load cells marked with M (multiple load cell applications), and $p_{LC} = 0.5$ for Class III L load cells marked with S or M.</p>			

Scales

	Yes	No	NA
<p>T.N.4.7. Creep Recovery for Load Cells During Type Evaluation. - The difference between the initial reading of the minimum load of the measuring range (D_{min}) and the reading after returning to minimum load subsequent to the maximum load (D_{max}) having been applied for 30 minutes shall not exceed:</p> <p>(a) 0.5 times the value of the load cell verification interval (0.5 v) for Class I, II, III, and III L load cells, or</p> <p>(b) 1.5 times the value of the load cell verification interval (1.5 v) for Class III L load cells.</p>			
<p>T.N.5. Repeatability. - The results obtained from several weighings of the same load under reasonably static test conditions shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.</p>			
<p>T.N.6. Sensitivity. - This section is applicable to all non-automatic-indicating scales marked I, II, III, III L, or III L.</p>			
<p>T.N.6.1. Test Load.</p> <p>(a) The test load for sensitivity for nonautomatic-indicating vehicle, axle-load, livestock, and animal scales shall be 1d for scales equipped with balance indicators, and 2d or 0.2 percent of the scale capacity, whichever is less, for scales not equipped with balance indicators.</p> <p>(b) For all other nonautomatic-indicating scales, the test load for sensitivity shall be 1d at zero and 2d at maximum test load.</p>			
<p>T.N.6.2. Minimum Change of Indications. - The addition or removal of the test load for sensitivity shall cause a minimum permanent change as follows:</p> <p>(a) for a scale with trig loop but without a balance indicator, the position of the weighbeam shall change from the center to the outer limit of the trig loop;</p> <p>(b) for a scale with balance indicator, the position of the indicator shall change one division on the graduated scale, the width of the central target area, or the applicable value as shown below, whichever is greater:</p> <ul style="list-style-type: none"> - Scale of Class I or II: 1 mm (0.04 in) - Scale of Class III or III L with a maximum capacity of 30 kg (70 lb) or less: 2 mm (0.08 in) - Scale of Class III, III L, or III L with a maximum capacity of more than 30 kg (70 lb): 5 mm (0.20 in); <p>(c) for a scale without a trig loop or balance indicator, the position of rest of the weighbeam or lever system shall change from the horizontal or midway between limiting stops to either limit of motion.</p>			
<p>T.N.7. Discrimination.</p> <p>T.N.7.1. Analog Automatic Indicating (i.e., Weighing Device With Dial, Drum, Fan, Etc.). A test load equivalent to 1.4d shall cause a change in the indication of at least 1.0d.</p>			

Scales

	Yes	No	NA										
<p>T.N.7.2. Digital Automatic Indicating. - A test load equivalent to 1.4d shall cause a change in the indicated or recorded value of at least 2.0d. This requires the zone of uncertainty to be not greater than three-tenths of the value of the scale division.</p>													
<p>T.N.8. Influence Factors. - The following factors are applicable to tests conducted under controlled conditions only, provided that:</p> <p>(a) types of devices approved prior to January 1, 1986, and manufactured prior to January 1, 1988, need not meet the requirements of this section; and</p> <p>(b) new types of devices submitted for approval after January 1, 1986, shall comply with the requirements of this section; and</p> <p>(c) all devices manufactured after January 1, 1988, shall comply with the requirements of this section.</p>													
<p>T.N.8.1. Temperature. - Devices shall satisfy the tolerance requirements under the following temperature conditions:</p>													
<p>T.N.8.1.1. If not specified in the operating instructions for Class I or II scales, or if not marked on the device for Class III, III L, or IIII scales, the temperature limits shall be:</p> <p style="text-align: center;">-10 °C to 40 °C (14 °F to 104 °F)</p>													
<p>T.N.8.1.2. If temperature limits are specified for the device, the range shall be at least that specified in Table T.N.8.1.2.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Table T.N.8.1.2. Temperature Range by Class</th> </tr> <tr> <th>Class</th> <th>Temperature Range</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>5 °C (9 °F)</td> </tr> <tr> <td>II</td> <td>15 °C (27 °F)</td> </tr> <tr> <td>III, III L, & IIII</td> <td>30 °C (54 °F)</td> </tr> </tbody> </table>	Table T.N.8.1.2. Temperature Range by Class		Class	Temperature Range	I	5 °C (9 °F)	II	15 °C (27 °F)	III, III L, & IIII	30 °C (54 °F)			
Table T.N.8.1.2. Temperature Range by Class													
Class	Temperature Range												
I	5 °C (9 °F)												
II	15 °C (27 °F)												
III, III L, & IIII	30 °C (54 °F)												
<p>T.N.8.1.3. Temperature Effect on Zero-Load Balance. - The zero-load indication shall not vary by more than:</p> <p>(a) three divisions per 5 °C (9 °F) change in temperature for Class III L devices; or</p> <p>(b) one division per 5 °C (9 °F) change in temperature for all other devices.</p>													
<p>T.N.8.1.4. Operating Temperature. - Except for Class I and II devices, an indicating or recording element shall not display nor record any usable values until the operating temperature necessary for accurate weighing and a stable zero balance condition have been attained.</p>													
<p>T.N.8.2. Barometric Pressure. - Except for Class I scales, the zero indication shall not vary by more than one scale division for a change in barometric pressure of 1 kPa over the total barometric pressure range of 95 kPa to 105 kPa (28 to 31 in of Hg).</p>													

Scales

	Yes	No	NA
<p>T.N.8.3. Electric Power Supply.</p> <p>T.N.8.3.1. Power Supply, Voltage and Frequency.</p> <p>(a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, when tested over the range of -15% to +10% of the marked nominal line voltage(s) at 60 Hz, or the voltage range marked by the manufacturer, at 60 Hz.</p> <p>(b) Battery operated instruments shall not indicate nor record values outside the applicable tolerance limits when battery power output is excessive or deficient.</p>			
<p>T.N.8.3.2. Power Interruption. - A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.</p>			
<p>T.N.9. 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 one scale division (d); or the equipment shall:</p> <p>(a) blank the indication, or (b) provide an error message, or (c) the indication shall be so completely unstable that it cannot be interpreted, or transmitted into memory or to a recording element, as a correct measurement value.</p> <p>The tolerance in T.N.9. is to be applied independently of other tolerances. For example, if indications are at allowable basic tolerance error limits when the disturbance occurs, then it is acceptable for the indication to exceed the applicable basic tolerances during the disturbance.</p>			

Scales

Table S.1.11 Categories of Device and Methods of Sealing	
<i>Categories of Device</i>	<i>Method of Sealing</i>
<i>Category 1: No remote configuration capability.</i>	<i>Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.</i>
<i>Category 2: Remote configuration capability, but access is controlled by physical hardware.</i> <i>Device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.</i>	<i>The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.</i>
<i>Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).</i>	<i>An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)</i>

Scales

Table S.6.3.a Marking Requirements					
To Be Marked With	Weighing, load-receiving, and indicating element in same housing or covered on the same CC ¹	Indicating element not permanently attached to weighing and load-receiving element or covered by a separate CC	Weighing and load-receiving element not permanently attached to indicating element or covered by a separate CC	Load cell with CC (11)	Other equipment or device (10)
Manufacturer's ID (1)	x	x	x	x	x
Model Designation and Prefix (1)	x	x	x	x	x
Serial Number and Prefix (2)	x	x	x	x	x (16)
Certificate of Conformance Number (CC) (23)	x	x	x	x	X (23)
Accuracy Class (17)	x	x (8)	x (19)	x	
Nominal Capacity (3)(18)(20)	x	x	x		
Value of Scale Division, "d" (3)	x	x			
Value of "e" (4)	x	x			
Temperature Limits (5)	x	x	x	x	
Concentrated Load Capacity (CLC) (12)(20)(22)		x	x (9)		
Special Application (13)	x	x	x		
Maximum Number of Scale Divisions (n_{max}) (6)		x (8)	x (19)	x	
Minimum Verification Scale Division (e_{min})			x (19)		
"S" or "M" (7)				x	
Direction of Loading (15)				x	
Minimum Dead Load				x	
Maximum Capacity				x	
Safe Load Limit				x	
Load Cell Verification Interval (v_{min}) (21)				x	
Section Capacity (14)(20)(22)(24)		x	x		
Note: For applicable notes, see Table S.6.3.b.					
¹ Weighing/load receiving elements and indicators which are in the same housing or which are permanently attached will generally appear on the same CC. If not in the same housing, elements shall be hard wired together or sealed with a physical seal or an electronic link. This requirement does not apply to peripheral equipment that has no input or effect on device calibrations or configurations.					

Scales

Table S.6.3.b	
Notes For Table S.6.3.a.	
<p>1. <i>Manufacturer's identification and model designation and model designation prefix.</i></p> <p>2. <i>Serial number and prefix.</i></p> <p>3. <i>The device shall be marked with the nominal capacity. The nominal capacity shall be shown together with the value of the scale division (e.g., 15 x 0.005 kg, 30 x 0.01 lb, or capacity = 15 kg, d = 0.005 kg) in a clear and conspicuous manner and be readily apparent when viewing the reading face of the scale indicator unless already apparent by the design of the device. Each scale division value or weight unit shall be marked on multiple range or multi-interval scales.</i></p> <p>4. <i>Required only if different from "d."</i></p> <p>5. <i>Required only on Class III, III L, and IIII devices if the temperature range on the NTEP CC is narrower than and within -10 °C to 40 °C (14 °F to 104 °F).</i></p> <p>6. <i>This value may be stated on load cells in units of 1 000; e.g., n: 10 is 10 000 divisions.</i></p> <p>7. <i>Denotes compliance for single or multiple load cell applications. It is acceptable to use a load cell with the "S" or Single Cell designation in multiple load cell applications as long as all other parameters meet applicable requirements. A load cell with the "M" or Multiple Cell designation can be used only in multiple load cell applications.</i></p> <p>8. <i>An indicating element not permanently attached to a weighing element shall be clearly and permanently marked with the accuracy Class of I, II, III, III L, or IIII, as appropriate, and the maximum number of scale divisions, n_{max}, for which the indicator complies with the applicable requirement. Indicating elements that qualify for use in both Class III and III L applications may be marked III/III L and shall be marked with the maximum number of scale divisions for which the device complies with the applicable requirements for each accuracy class.</i></p>	<p>9. <i>For vehicle and axle-load scales only. The CLC shall be added to the load-receiving element of any such scale not previously marked at the time of modification.</i></p> <p>10. <i>Necessary to the weighing system but having no metrological effect, e.g., auxiliary remote display, keyboard, etc.</i></p> <p>11. <i>The markings may be either on the load cell or in an accompanying document; except that, if an accompanying document is provided, the serial number shall appear both on the load cell and in the document. The manufacturer's name or trademark, the model designation, and identifying symbol for the serial number shall also be marked both on the load cell and in any accompanying document.</i></p> <p>12. <i>Required on the indicating element and the load-receiving element of vehicle and axle-load scales. Such marking shall be identified as "concentrated load capacity" or by the abbreviation "CLC".</i></p> <p>13. <i>A scale designed for a special application rather than general use shall be conspicuously marked with suitable words, visible to the operator and to the customer, restricting its use to that application, e.g., postal scale, prepack scale, weight classifier, etc. When a scale is installed with an operational counting feature, the scale shall be marked on both the operator and customer sides with the statement "The counting feature is not legal for trade", except when a Class I or Class II prescription scale complies with all Handbook 44 requirements applicable to counting features.</i></p> <p>14. <i>Required on livestock and railway track scales. When marked on vehicle and axle-load scales manufactured before January 1, 1989, it may be used as the CLC. For livestock scales manufactured between January 1, 1989 and January 1, 2003, required markings may be either CLC or section capacity.</i></p>

Scales

Table S.6.3.b

Notes For Table S.6.3.a. (Continued)

- | | |
|--|--|
| <p>15. <i>Required if the direction of loading the load cell is not obvious.</i></p> <p>16. <i>Serial number and prefix.</i> Modules without "intelligence" on a modular system (e.g., printer, keyboard module, cash drawer, and secondary display in a point-of-sale system) are not required to have serial numbers.</p> <p>17. <i>The accuracy Class of a device shall be marked on the device with the appropriate designation as I, II, III, III L, or IIII.</i></p> <p>18. The nominal capacity shall be conspicuously marked as follows:</p> <ul style="list-style-type: none"> (a) on any scale equipped with unit weights or weight ranges; (b) on any scale with which counterpoise or equal-arm weights are intended to be used; (c) on any automatic-indicating or recording scale so constructed that the capacity of the indicating or recording element, or elements, is not immediately apparent; (d) on any scale with a nominal capacity less than the sum of the reading elements; and (e) <i>on the load-receiving element (weigh-bridge) of vehicle, axle-load, and livestock scales.</i> | <p>19. <i>Nonretroactive as of January 1, 1988.</i></p> <p>20. <i>Combination vehicle/railway track scales must be marked with both the nominal capacity and CLC for vehicle weighing and the nominal capacity and section capacity for railway weighing. All other requirements relating to these markings will apply.</i></p> <p>21. The value of the load cell verification interval (v_{min}) must be stated in mass units. In addition to this information, a device may be marked with supplemental representations of v_{min}.</p> <p>22. <i>Combination vehicle/livestock scales must be marked with both the CLC for vehicle weighing and the section capacity for livestock weighing. All other requirements relative to these markings will apply.</i></p> <p>Note: <i>The marked section capacity for livestock weighing may be less than the marked CLC for vehicle weighing.</i></p> <p>23. <i>Required only if a CC has been issued for the device or equipment.</i></p> <p>24. <i>The section capacity shall be prefaced by the words "Section Capacity" or an abbreviation of that term. Abbreviations shall be "Sec Cap" or "Sec C". All capital letters and periods may be used.</i></p> |
|--|--|

Scales

Table 3			
Parameters for Accuracy Classes			
Class	Value of the verification scale division (<i>d</i> or <i>e</i> ¹)	Number of scale ⁴ divisions (<i>n</i>)	
		Minimum	Maximum
SI Units			
<i>I</i>	equal to or greater than 1 mg	50 000	-----
<i>II</i>	1 to 50 mg, inclusive	100	100 000
<i>III</i> ^{2, 5}	equal to or greater than 100 mg	5 000	100 000
	0.1 to 2 g, inclusive	100	10 000
<i>III L</i> ³	equal to or greater than 5 g	500	10 000
	equal to or greater than 2 kg	2 000	10 000
<i>IIII</i>	equal to or greater than 5 g	100	1 200
INCH-POUND Units			
<i>III</i> 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
<i>III L</i> ³	equal to or greater than 5 lb	2 000	10 000
<i>IIII</i>	greater than 0.01 lb	100	1 200
	greater than 0.25 oz	100	1 200
<p>¹ For Class <i>I</i> and <i>II</i> 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 "<i>e</i>" is the value of the scale division immediately preceding the auxiliary means.</p> <p>² A scale marked "For prescription weighing only" may have a verification scale division (<i>e</i>) not less than 0.01 g.</p> <p>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.</p> <p>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, <i>n</i>, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, <i>e</i>, 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 <i>n</i>_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.</p> <p>⁵ The minimum number of scale divisions for a Class <i>III</i> Hopper Scale used for weighing grain shall be 2000.</p>			

Scales

Table 6 Maintenance Tolerances (All values in this table are in scale divisions)				
Tolerance in Scale Divisions				
	1	2	3	4
Class	Test Load			
I	0 – 50 000	50 001 - 200 000	200 001 +	
II	0 – 5 000	5 001 - 20 000	20 001 +	
III	0 – 500	501 - 2 000	2 001 - 4 000	4 001 +
IIII	0 – 50	51 - 200	201 - 400	401 +
II L	0 – 500	501 - 1 000	(Add 1d for each additional 500d or fraction thereof)	

Table T.N.4.6. Maximum Permissible Error (mpe)* for Load Cells During Type Evaluation			
mpe in Load Cell Verifications Divisions (v) = $p_{LC} \times$ Basic Tolerance in v			
Class	$p_{LC} \times 0.5 v$	$p_{LC} \times 1.0 v$	$p_{LC} \times 1.5 v$
I	0 – 50 000 v	50 001 v – 200 000 v	200 001 v +
II	0 – 5 000 v	5 001 v – 20 000 v	20 001 v +
III	0 – 500 v	501 v – 2 000 v	2 001 v +
IIII	0 – 50 v	51 v – 200 v	201 v +
III L	0 – 500 v	501 v – 1 000 v	(Add 0.5 v to the basic tolerance for each additional 500 v or fraction thereof up to a maximum load of 10 000 v)

v represents the load cell verification interval
 p_{LC} represents the apportionment factors applied to the basic tolerance
 $p_{LC} = 0.7$ for load cells marked with S (single load cell applications)
 $p_{LC} = 1.0$ for load cells marked with M (multiple load cell applications)
 $p_{LC} = 0.5$ for Class III L load cells marked with S or M.
 * mpe = $p_{LC} \times$ Basic Tolerance in load cell verifications divisions (v)