DIVISION OF MEASUREMENT STANDARDS (DMS)

CALIFORNIA TYPE EVALUATION PROGRAM (CTEP)

SCALE SYSTEM CONTROLLERS INTERFACED WITH A WEIGHING SYSTEM

(SOFTWARE BASED DEVICES)

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SCALE SYSTEM CONTROLLERS

Interfaced with a Weighing System*

CHECKLIST

NOTE: *All Code References are from Title 4 of the California Code of Regulations*

1. Marking – General Code Requirements, Identification

Code References: G-S.1. and G-S.7.:

Virtually all weighing and measuring equipment (except separate parts necessary to the measurement process but not having any metrological effect) must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number.

2. Marking Requirements – Scale System Controllers (Software-Based Devices)

Code Reference G.S.1.1. Location of Marking Information for Not Built-for-Purpose, Software-Based Devices

A. For software-based devices the following shall apply:

(1) The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or — Yes ☐ No ☐ N/A ☐

(2) The Certificate of Approval Number shall be: — Yes ☐ No ☐ N/A ☐
- permanently marked on the device; or
- continuously displayed; or
- accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

NOTE*: For (2.1.2.), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the Certificate, including information necessary to identify that the software in the device is the same type that was evaluated.*

(3) The version or revision designation shall be prefaced by the word "Version" or "Revision" as appropriate and either word may be followed by the word "Number." The abbreviations for the word “Version” shall, at a minimum, begin with the letter "V". The abbreviation for the word “Number” shall, at a minimum, begin with the letter "N" (e.g., No or No.). Acceptable examples include, “Ver. 1234,” “V 1234,” “REV 1234,” and “R 1234.” Unacceptable abbreviations include “v 1234,” “ver 1234,” “r 1234,” and “rev 1234.” — Yes ☐ No ☐ N/A ☐

B. If the menu or submenu is used to access the required marking information, the menu or submenu must be a part of the main operator screen that is used during normal operation of the device. Yes ☐ No ☐ N/A ☐

**At a minimum a weighing system consist of a digital weight indicator interfaced with a weighing/load-receiving element.*

C. If the menu or submenu is used to access required marking information it must be limited to view only access. Yes ☐ No ☐ N/A ☐

List instructions for accessing the required G-S.1. markings using a menu or submenu, or by referencing the information on the CC:

3. Additional Marking Requirements – Weighing/Load-receiving Elements

Code References: S.6., Table S.6.3.a., and Table S.6.3.b.

Weighing/load-receiving elements (W/LRE)and indicators that are; (1) in the same housing, or (2) permanently hard wired together, or (3)sealed with a physical seal or an electronic link, shall have markings that comply with section "1 Markings - Applicable to Indicating, Weighing/Load-Receiving Elements and Complete Scales". This does not apply to indicating elements that have no input or effect on weighing/load-receiving element calibrations or configurations.

Weighing/load-receiving elements that are not permanently attached to the indicator may be interfaced with many different indicators. Consequently, these weighing/load-receiving elements must be marked with information that clearly identifies the manufacturer, the model, and the capacity of the weighing/load-receiving element.

See Appendix "A" for additional information on marking requirements.

Weight indicator information:

Manufacturer: _____

Model: _____

Certificate Number: _____

Load receiving element information:

Manufacturer: _____

Model: _____

Certificate Number: _____

4. Marking – Operational Controls, Indications, and Features

Code Reference: G-S.6.

Individual and multi-function keys must be marked to reflect their function, but keypads do not have to be marked. It is believed that keys and operator controls visible to a customer in a direct sale transaction provide very little assistance to the customer to understand the transaction. The customer relies mainly upon the display to understand the transaction. Consequently, the marking of keys is not controlled although manufacturers are encouraged to mark them in a manner that reflects the metrological purpose of the keys. Keys visible only to the operator need only be marked to the extent that a trained operator can understand the function of each key. Nonfunctional annunciators may be marked or unmarked. Programmable keys may be included in the Certificate if the keys are not metrologically significant. If the keys perform metrologically significant functions, then the functions of the keys must be evaluated. The manufacturer must notify the CTEP if, after the evaluation, metrologically significant features are added to a device through these keys.

A.	All operational controls, indications, and features, including switches, lights, displays, and push buttons, shall be clearly and definitely identified	Yes ☐ No ☐ N/A ☐
B.	Individual and multi-function keys or controls shall be marked to clearly identify all functions.	Yes ☐ No ☐ N/A ☐
C.	Front panel mounted toggle switches must identify the switch position and function by a lighted annunciator, e.g., a LED with the silk-screened legend Gross or Net.	Yes ☐ No ☐ N/A ☐
D.	All operational controls and features located on the back of the controller shall be clearly identified.	Yes ☐ No ☐ N/A ☐
E	All interface connections on the controller shall be identified by words, symbols or codes unless the individual connections are keyed to provide only the intended interface or if the interchange or an unintended connection will not detrimentally affect the performance of the system. Parts which provide only an internal connection need not be identified.	Yes ☐ No ☐ N/A ☐
F.	Error codes shall be properly defined in the operating manual.	Yes ☐ No ☐ N/A ☐
G.	All required markings and instructions shall be distinct and easily readable and not tend to become obliterated or illegible.	Yes ☐ No ☐ N/A ☐

5. Customers' Indications

Code Reference: S.1.8.3.

In a direct sale application, a customer has the responsibility to verify that the various aspects of the sale are correct. Consequently, metrologically significant information must be made available to the customer, particularly if it is provided to the operator. To facilitate value comparisons and to recognize current sales practices, unit prices shall be in whole units of weight or multiples of whole units. Controllers indicating in metric units may indicate the price per 100 grams. Otherwise, fractional pricing is prohibited. Multiplier keys that multiply the unit price entry by 2 or 4 are acceptable because the unit price is always in whole units of weight.

Scale System Controllers used with shipping scales must display to the customer the same metrologically significant numerical information as is on the operator's display. As a minimum, the customer display must include the shipping weight, zone code, and total price.

A.	Any indication of function or condition shall not be represented in a manner which interferes with the interpretation of weight. For example, a "+" and a "-" sign used as an over/under indication may not be placed adjacent to a weight value.	Yes ☐ No ☐ N/A ☐
B.	If the operator's side of the scale indicates net weight, unit price and total price, the customer's side must indicate the same information in the same units.	Yes ☐ No ☐ N/A ☐
C.	Customer's unit price display must be in terms of whole units' price per pound or multiple pound prices, (e.g., 3 lb/$1.00) except for scales indicating in metric units which may indicate unit prices in price per 100 grams. 'Otherwise, fractional pricing, (i.e., 1/4 lb or 1/2 lb prices) is prohibited.	Yes ☐ No ☐ N/A ☐
D.	Multiplier keys are permitted. If provided, multiplier keys shall function only once after a particular unit price has been entered. After a particular multiplier key has been activated, only one multiplication can be performed, and the other multiplier key must be temporarily immobilized.	Yes ☐ No ☐ N/A ☐
E.	For shipping scales, the customer's side must display the same metrologically significant numerical information as is on the operator's display. This includes as a minimum, the shipping weight, zone code, and total price. (weighing sector, June 16-17, 1992)	Yes ☐ No ☐ N/A ☐

6. Provision For Metrological Sealing of Adjustable Components or Audit Trail

Code References: G-S.8.1. and **S.1.11.**

Scale System controllers generally rely on the indicating and weighing elements method of sealing to maintain the systems overall integrity. However measures need to be in place to protect the integrity of the controlling software based programming to prevent the facilitation of fraud. Program source code information is generally kept from the user and is maintained by the developer.

Describe the developers' method of protecting and maintaining the controllers metrological and program integrity:

_____

Due to the ease of adjusting the accuracy of electronic scales, all scales (except for Class I scales) must provide for a security seal that must be broken or provide an audit trail, before any adjustment that detrimentally affects the performance of the electronic device can be made. Only metrological parameters that can affect the measurement features that have a significant potential for fraud and features or parameters whose range extends beyond that appropriate for device compliance with Handbook 44 or the suitability of equipment, shall be sealed.

See Appendix "B" for additional information on sealing.

The judgment of whether or not a method of access to an adjustment represents a "significant potential for fraud" and will normally require sealing for security will be made based upon the application of the philosophy found in Appendix B.

7. Indicating and Recording Elements - General

Code References: G-S.2., G-S.5.1., G-S.5.2.2., and S.1.2.

There are several general requirements to facilitate the reading and interpretation of displayed weight values. Other requirements address the proper operation of indicating and recording elements.

A. Except for batching scales, the value of the scale division in all available weight units for both indicating and recording elements must be in values of 1, 2, or 5 times 10k where k is an integer, e.g., 0.1, 0.2, or 0.5; 1, 2, or 5; 10, 20, or 50, etc. Yes ☐ No ☐ N/A ☐

B. Except for postal scales, digital weight values shall be in a single unit of measure. Yes ☐ No ☐ N/A ☐

C. Digits for indications or recorded representations must be uniform in size and character (unless $d \neq e$). Yes ☐ No ☐ N/A ☐

D. All indications or recorded representations shall be uniform throughout the series (i.e., the width of each scale division must be the same in terms of weight). Yes ☐ No ☐ N/A ☐

E. For controllers indicating in two or more units, consecutive scale division values shall be indicated throughout the entire weighing range for all units. Yes ☐ No ☐ N/A ☐

F. If the video display (monitor) gives the only weight indication for the controller, the weight display must be a continuous live display. It must be located in an area dedicated to the weight display and clearly distinguished and separated from other information on the display. (If the video display is in addition to another primary display (digital weight indicator), the operator's display need not be a "live" display, but the weight information must be in a dedicated area and separated from the other information on the display.) Yes ☐ No ☐ N/A ☐

G. Subordinate indications or recorded representations must be appropriately designated or portrayed. Yes ☐ No ☐ N/A ☐

H. The minimum acceptable indication of zero balance must be one of the following:

(1) If a decimal point is used, at least one digit to the left and all digits to the right of the decimal point must be displayed. Yes ☐ No ☐ N/A ☐

(2) If a decimal point is not used, at least one active decade plus any constant (fixed) zeros must be displayed. Yes ☐ No ☐ N/A ☐

(3) All decades to the right of a decimal point must be active, (i.e., a fixed zero cannot appear to the right of a decimal point). Yes ☐ No ☐ N/A ☐

Capacity (lb)	Minimum Zero Indication (lb)
25 x 0.01	0.00
5000 x 1	0
100 000 x 20	00

Examples

(4) Does the controller have a screen saver, sleep mode or power save? Yes ☐ No ☐ N/A ☐

Manufacturers have been adding screen savers and sleep modes for the purpose of prolonging the useful life of displays or provide promotional or other information on displays during periods of scale inactivity.

Additionally, some controllers have automatic shut-off, or power (battery) save modes. These features promote energy conservation or prolong battery life in battery-operated controllers. This feature either automatically turns off the controller after a period of inactivity or only turns off the display.

Does the controller utilize a screen saver or sleep mode option? Yes ☐ No ☐ N/A ☐

If yes, see Appendix "C"

I. Digital elements shall be designed so that:

(1) All digital values of like value in system must agree with one another. Yes ☐ No ☐ N/A ☐

(2) Displayed and printed values of gross, tare, and net must be in the same weight units. Yes ☐ No ☐ N/A ☐

(3) Each digital value must coincide with its associated analog value to the nearest graduation. Yes ☐ No ☐ N/A ☐

(4) All digital values must round to the nearest scale division. Yes ☐ No ☐ N/A ☐

J. When dead-load verification values, electronic recalibration values, electronic display verification sequences, or other test values are displayed by an indicator (or a video display terminal getting weight values from a separate primary indicator) the device shall either:

(1) not print; or Yes ☐ No ☐ N/A ☐

(2) provide a clear and continuous indication on the printed representations that the displayed value is other than a valid weight representation. Yes ☐ No ☐ N/A ☐

K. A controller must not display or record any values when the correct calculated values exceed the display or printing capability. (An entry of 8 digits made into a defined field length of 7 digits will give an error indication.) Yes ☐ No ☐ N/A ☐

L. Upon return to gross load zero, a device may automatically display other information. For example, it may cycle the time, date, and zero indications, provided that the display for the other information occurs only when the scale is at zero and the zero indication can be displayed or is displayed as part of the cycled information. The values must be clearly defined. The controller must inhibit a weighing operation, display weight values or give an out-of-balance indication whenever the scale is out of zero balance. Yes ☐ No ☐ N/A ☐

M. If the controller has the ability to "Print Screen," it shall not resemble a valid transaction when printed on a weight ticket. Yes ☐ No ☐ N/A ☐

N. If the controller display uses only a portion of the most significant decade (MSD), i.e., the MSD is used for both the minus (-) sign and indicating the number "1", the device is required to meet one of the following two conditions: Yes ☐ No ☐ N/A ☐

(1) It must not simultaneously display the digit "1" and the minus sign in the MSD, or Yes ☐ No ☐ N/A ☐

(2) There must be clearance between the "-" and the digit "1" in the MSD. Yes ☐ No ☐ N/A ☐

O. Any indication of function or condition shall not be represented in a manner that interferes with the interpretation of weight. For example, a "+" and "-" sign used as an over/under indication may not be placed adjacent to a weight value. Yes ☐ No ☐ N/A ☐

P. A "hold" feature, that is, a feature that locks a weight value into the primary weight display and permits the printing of tickets, is **not** acceptable. Yes ☐ No ☐ N/A ☐

Q. In the event the indicating or recording element can be disconnected from the controller, load cell(s) or weighing/load-receiving element input(s) without the use of a tool or breaking a security seal, any weight indication or other information (error codes) that remains on the display shall not be interpreted, printed, or stored in memory as a valid weight. This should be tested and verified by disconnecting the controller, or load cell(s) or weighing/load-receiving element(s) while the indicating element is displaying; a negative gross weight or error condition, a zero load condition, a positive gross weight, and an overload condition. Yes ☐ No ☐ N/A ☐

(1) First remove power from the indicating element, disconnect the load cell input or weighing/load-receiving element, and then reapply power to the indicating element. The controller and indicating element should display an error code or other meaningless information that cannot be interpreted, printed or stored as a correct weight.

Perform the test with the display at a gross load zero indication. Yes ☐ No ☐ N/A ☐

Repeat the test with the indicator displaying the following conditions prior to removal of the load cell input. Yes ☐ No ☐ N/A ☐

. A negative gross weight or behind zero error indication Yes ☐ No ☐ N/A ☐

A positive gross weight. Yes ☐ No ☐ N/A ☐

An overcapacity indication Yes ☐ No ☐ N/A ☐

Reconnect the load cell. The display should indicate the correct weight or an error code or other meaningless information that cannot be interpreted, printed, or stored as a correct weight. Yes ☐ No ☐ N/A ☐

(2) Repeat the procedure described in 11.18.1, except the load cell input or weighing/load-receiving element should be disconnected with the indicating element connected to normal power supplies. The indicating element should display an error code or other meaningless information that cannot be interpreted, printed or stored as a correct weight.

Perform the test with the display at a gross load zero indication. **Yes** ☐ **No** ☐ **N/A** ☐

Repeat the test with the indicator displaying the following conditions prior to removal of the load cell input. **Yes** ☐ **No** ☐ **N/A** ☐

A negative gross weight or behind zero error indication. **Yes** ☐ **No** ☐ **N/A** ☐

A positive gross weight.	**Yes** ☐ **No** ☐ **N/A** ☐
An overcapacity indication	**Yes** ☐ **No** ☐ **N/A** ☐
Reconnect the load cell. The display should indicate the correct weight or an error code or other meaningless information that cannot be interpreted, printed, or stored as a correct weight.	**Yes** ☐ **No** ☐ **N/A** ☐

If required see **Appendix D** for additional test criteria regarding wireless communications devices.

8. Values Defined

Code References: G-S.5.2.4., G-S.5.3.1., G-S.5.6., and G-S.5.6.1.

Graduations, indications, and recorded values that are intended to have specific values shall be adequately identified by a sufficient number of figures, words, and symbols. These defining terms shall be uniformly placed relative to the graduations, indications, and recorded values and as close as practical to them without interfering with their readability. When SI units are used, the symbols shall comply with those in Appendix C (General Tables of Units of Measurement) in Handbook 44 or NIST Special Publication SP 811 "Guide for the Use of International System of Units (SI)." **Other symbols shall comply with the abbreviations given in Appendix C (General Tables of Units of Measurement) in Handbook 44**. Exceptions are the abbreviations for "carat" (c or ct), U.S. short ton (ton or TN), U.S. "long ton" (LT), and "grain" in Publication 14 DES Section 76. **Also see Appendix G of this document for the text of DMS Notice D-08-4 which contains a list of the most common acceptable abbreviations for units.**

A.	Indications or recorded representations shall be properly defined by figures, words, or symbols (e.g., lb, oz, kg, $).	Yes ☐ No ☐ N/A ☐
B.	Dual Indications.	
(1)	The lower case "kg" must be used when the symbol for kilogram is displayed.	Yes ☐ No ☐ N/A ☐
(2)	The lower case "kg" should be used for printing when possible. The upper case "KG" is an acceptable symbol for kilogram only if the lower case "kg" cannot be printed. Uppercase KG is not acceptable for package labels.	Yes ☐ No ☐ N/A ☐
(3)	Any other metric symbols must comply with those given in Table 1 of the NIST Handbook 44 General Code.	Yes ☐ No ☐ N/A ☐
(4)	An indicator with an external lb/kg conversion switch must identify the weight units in which the display is indicating and the controller display must correspond with the indicator.	Yes ☐ No ☐ N/A ☐
C.	Occasionally, a weighing system will indicate in one weight unit and convert the weight value to another weight unit for billing and accounting purposes (e.g., indicate in pounds and convert to tons). When this is done, the following must be satisfied:	Yes ☐ No ☐ N/A ☐
(1)	Primary weight indications and recorded values must agree as specified in Handbook 44 and must be in the same unit of weight.	Yes ☐ No ☐ N/A ☐

(2) Derived indications and recorded representations may be in other units of weight provided: Yes ☐ No ☐ N/A ☐

(a) they are mathematically correct and based on the General Tables of Weights and Measures found in Handbook 44; Yes ☐ No ☐ N/A ☐

(b) they are of equal resolution to the primary weight indication; and Yes ☐ No ☐ N/A ☐

(c) rounding is not performed until the last mathematical operation. Yes ☐ No ☐ N/A ☐

9. Recorded Representations

Code References: G-S.5.6., G-S.5.1., and G-S.5.2.5.

All recorded values must be permanent, legible, and printed in a digital format. Although Handbook 44 does not require vehicle scales to print gross, tare, and net weight, some State weighmaster laws require the printing of all three values.

All recorded weight values must be clearly defined.

The primary weight indication and the printed value must agree exactly as specified in NIST Handbook 44 and must be in the same unit of weight. Derived indications and recorded representations may be in other units of weight provided the following criteria are satisfied.

a. They are mathematically correct. That is, they are based upon the values specified in the General Tables of Weights and Measures found in NIST Handbook 44.

b. They are of equal resolution to the primary weight indication; and

c. Rounding is not performed until the last mathematical operation.

A. All weight values, such as gross, tare, net, or inbound shall be clearly defined. To meet California Weighmaster requirements other recorded information, such as time, date, scale identification, commodity, vehicle number, or memory register needs to be defined. " Yes ☐ No ☐ N/A ☐

NOTE: *Preprinted weight tickets stating the weight unit may be acceptable in some applications.*

B. A printer must record the same value and number of decimal places as indicated in the display. Example: A digital indicator may display weight values to 0.01 lb and 0.005 kg. The printer must record a weight value in pounds to 0.01 lb; not to 0.010 lb. Yes ☐ No ☐ N/A ☐

C. The recorded values of the gross, tare, and net weight shall be mathematically correct, that is, gross weight = net weight + tare weight. Yes ☐ No ☐ N/A ☐

D. The recorded values shall agree with the indicated values. Yes ☐ No ☐ N/A ☐

E. Derived values must be correct mathematical conversions from the indicated values with rounding performed at the last step of conversion to ensure mathematical agreement. Yes ☐ No ☐ N/A ☐

Weighmaster Certificate

If the controller will issue a California Weighmaster Certificate, you should contact the Weighmaster Enforcement Program at (916) 229-3000 with any questions regarding your certificate's compliance with weighmaster laws.

During the evaluation process, the evaluator will forward a completed copy of your weighmaster certificate(s) to the Weighmaster Enforcement Program for review.

Forwarded by:_____Date:_____

10. Money Values, Mathematical Agreement

Code Reference: G-S.5.5.

All indicated and recorded digital money values shall be in mathematical agreement with their associated quantity representations to the nearest one cent. Yes ☐ No ☐ N/A ☐

11. General Considerations

To prevent the indication or recording of erroneous weight values, the following requirements must be met.

A. Use of any operational functions or options shall not facilitate fraud. Yes ☐ No ☐ N/A ☐

B. The equipment, through its characteristics and design, shall not facilitate fraudulent operation. Yes ☐ No ☐ N/A ☐

C. For systems having the weigh-in/weigh-out feature, but interfaced with a separate indicating element, the separate indicating element must indicate in the gross weight mode only. The tare and net features must be deactivated to restrict weight input to the weigh-in/weight-out feature to be gross weight only. The system must only accept weight values when the scale indicator is in the gross weight display mode. (Gross weight scale indicators without external lb/kg conversion may be used.) Yes ☐ No ☐ N/A ☐

12. Manual Weight Entries

Code References: G-S.2. and S.1.12.

The following apply to licensed weighmaster locations where a weighmaster certificate is issued by the controller.

A. Manual entries of gross or net weights are permitted when being used for direct sales in the following applications only: Yes ☐ No ☐ N/A ☐

- on livestock scales and vehicle scales to correct erroneous tickets; and
- when an item is pre-weighed on a legal-for-trade scale and marked with the correct net weight.

B. The scale shall be at gross-load or net zero and the scale indication shall be at zero-before manual weight entries are permitted (except for scales being used not-for-direct sales to the customer) and; Yes ☐ No ☐ N/A ☐

C. Recorded weight values shall be identified as MAN WT, MANUAL WT, MAN WEIGHT, or similar statement. Recorded manual gross or net weight values must be adequately defined so it is clear that the weight values are manual gross or net weight entries. Yes ☐ No ☐ N/A ☐

The use of a symbol to identify multiple manual weight entries 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.

D. Manual tare entries shall not interact with a feature that compares one weight value to another to identify the larger weight as the gross weight. Yes ☐ No ☐ N/A ☐

E. Manual tickets may be entered from scales that are not interfaced (physically connected) to the system provided it is clearly stated on the ticket. Yes ☐ No ☐ N/A ☐
NOTE: *The use of a "hot key" or other means to selectively interrupt communication with the scale is not permitted.*

F. In the normal weighing mode, when scale to controller communications exists, manual gross and net weights cannot be entered for a new (not voided) ticket. Manual gross and tare weights can be entered for new tickets if scale communication is lost. Scale reading errors such as motion, below zero, over capacity, wrong display units are not considered a loss of communication with the scale. Yes ☐ No ☐ N/A ☐

A conspicuous message must be printed on the ticket that this is a manual generated weigh-ticket.

13. Zero Indication (Negative Balance Condition) - General

Code Reference: G-S.5.1. G-S.1, S.6.3.

Any of the following methods may be used to indicate a negative balance condition.

A. Display of negative values. Yes ☐ No ☐ N/A ☐

A display of negative weight values is required in the net display mode when the gross weight is less than the tare value. This assumes that the gross weight is zero or positive. If the gross weight is negative (behind zero-balance condition), and if blanking the display is used to indicate a behind-zero-balance condition, the gross and net display may blank.

B. Blanking the display Yes ☐ No ☐ N/A ☐

This method cannot be used to indicate a negative balance condition if the device also: (1) blanks the display to indicate over-capacity and (2) the load condition of the load-receiving element is not evident to the operator, (e.g., a hopper scale where the operator cannot see the load condition, empty or full, of the hopper).

If blanking is used, it is recommended that the indicator also have an annunciator to indicate "power on," so the operator does not think that power has been lost when the display is blank.

(1) When blanking a primary weight display with live on screen G-S.1 and/or S.6.3. markings, the required markings must **not** blank. Yes ☐ No ☐ N/A ☐

C. Display of a symbol which cannot be interpreted as a quantity value, (e.g., -, ---, EEEE, E S-1) is acceptable, however, the display of complements are not acceptable, and flashing zeros or a minus sign preceding a zero or zeros cannot be used. Yes ☐ No ☐ N/A ☐

14. Weigh-In/Weigh-Out Systems

A weigh-in/weigh-out system is typically a vehicle scale in which an in-bound truck is weighed either loaded or empty; the inbound weight is stored; the truck is then emptied or loaded. The outbound truck is weighed, and the larger of the two weights (outbound or stored weight) is printed as the gross weight. The other printed as the tare weight and the difference computed as the net weight. In-bound weights, recalled weight values, and gross, tare, and net weights must be identified to clearly document the transaction. The storage, recalling, and printing actions are limited so they do not facilitate fraud.

A. Any in-bound weight values shall be recorded and automatically identified as such. If in-bound weights are not printed at the time the weigh-in operation is performed, then the in-bound weight information shall not be lost during a power interruption. Yes ☐ No ☐ N/A ☐

B. The gross, tare, and net weight values shall be recorded in an automatic sequence when the out-bound weight value is obtained. Yes ☐ No ☐ N/A ☐

C. The recorded gross weight value is not required to be automatically identified as a gross weight value, provided that the other two weight values are clearly and automatically identified as net and tare. Yes ☐ No ☐ N/A ☐

D. If a device can indicate and/or record in two or more weight units, all gross, tare and net weight values shall be automatically recorded in the same weight units. This condition must be met regardless which weight unit is being displayed. Yes ☐ No ☐ N/A ☐

E. Any weigh-in/weigh-out memory register shall automatically clear and not be retained in memory after a complete transaction of gross, tare, and net has been recorded. Yes ☐ No ☐ N/A ☐

F. Any recorded weighing value from the memory register shall be automatically identified and defined. Yes ☐ No ☐ N/A ☐

G. Tare values shall not be stored as negative values. (Negative numbers shall not be accepted.) Yes ☐ No ☐ N/A ☐

H. Keyboard tare entries shall not be accepted into weigh-in/weigh-out memory — Yes ☐ No ☐ N/A ☐

I. If the system is equipped with a tare memory register for weighing gross, tare, and net separate from the weigh-in/weigh-out feature, the tare weight shall not interact with the weigh-in/weigh-out feature. — Yes ☐ No ☐ N/A ☐

J. The data processing system performing the weigh-in/weigh-out operation will only accept weight values when the scale indicator is in the gross mode or give an error signal. — Yes ☐ No ☐ N/A ☐

15. Tare Operation - Facilitation of Fraud

Code References: G-S.2., G-S.5.1., G-S.5.2.2., and G-S.5.6.

Numerous requirements establish the proper operation of the tare features depending upon the type of tare capability provided in the scale. These requirements are based upon the broad requirement that no device or feature shall facilitate perpetrating of fraud. The perpetration of fraud is interpreted to apply both to intentional actions and inadvertent actions. Because tare capabilities have a significant potential to facilitate fraud if not properly designed, the type evaluation criteria are extensive. It is recommended that the video display terminal that is the primary indicator simultaneously display GROSS, TARE, and NET weights on the display when the NET weight value has been determined. Record the type of tare capability available:

☐ NO TARE CAPABILITY	☐ DIGITAL	☐ KEYBOARD
☐ SEMI-AUTOMATIC TARE	☐ PROGRAMMABLE	☐ OTHER

A. Controllers equipped with a tare capability are required to provide a clear indication that a tare value has been entered. This indication may be GROSS and NET indications (display modes). If the tare value can be cleared when a load is on the platform, a clear indication that the tare value has been eliminated must be provided. There are several options for complying with this requirement. At least one of the following methods must be used to indicate that a tare value has been entered. Indicate which method is used.

(1) A separate continuous display of tare. — Yes ☐ No ☐ N/A ☐

(2) The controller has selectable GROSS, TARE, and NET weight display modes with proper descriptors for this information. — Yes ☐ No ☐ N/A ☐

(3) The controller has selectable GROSS and NET weight display modes with proper descriptors for this information. — Yes ☐ No ☐ N/A ☐

(4) The display indicates only the net weight and a NET legend or annunciator appears when a tare weight is entered. Gross weight is displayed when the tare weight entry is zero and the NET legend or annunciator is off. — Yes ☐ No ☐ N/A ☐

B. An entry of "zero" tare should not cause the display to automatically switch to the NET display mode. (Scales equipped with a continuous tare display or tare display mode will indicate zero when the tare weight entry is zero; however, the entry of zero tare must not cause the display to automatically switch to the NET mode.) — Yes ☐ No ☐ N/A ☐

C. If a controller is equipped with semi-automatic tare and keyboard tare, the entry of either tare value shall reject or automatically clear any previous tare entry (i.e., they cannot be additive). — Yes ☐ No ☐ N/A ☐

D. The tare weight plus the net weight must always equal the gross weight. — Yes ☐ No ☐ N/A ☐

E. When in the net mode, the system shall indicate negative net weight values (within the capacity of the display) when the gross weight is less than the tare weight. Yes ☐ No ☐ N/A ☐

F. When units are converted, the weight unit selector switch must convert both the weight display and tare values to the same weight unit. Yes ☐ No ☐ N/A ☐

16. Keyboard and Programmable Tare

Keyboard and programmable tare entries must be visible at some point in the transaction so the entry can be verified.

A. One of the following conditions must be met for keyboard and programmable tare entries. Indicate the method used in the check box provided.

(1) The device has a tare display, separate from the weight display that continuously indicates the entered tare weight. Yes ☐ No ☐ N/A ☐

(2) The device has a selectable tare display mode activated by key or switch and

(a) Tare values may be entered only when the tare mode is selected, or Yes ☐ No ☐ N/A ☐

(b) Tare values may be recalled and verified at any time. Yes ☐ No ☐ N/A ☐

(3) Entries are permitted only when there is no load on the platform. Yes ☐ No ☐ N/A ☐

(4) The device indicated gross weights only with the tare or net weight on a printed ticket. Yes ☐ No ☐ N/A ☐

NOTE: *Under items 18.1.1., 18.1.2., and 18.1.4., the tare value may be entered when a load is on the scale platform.*

B. Keyboard and programmable tare value entries shall be consistent with the displayed scale division in all weight units. Yes ☐ No ☐ N/A ☐

If a tare value that is not consistent with the displayed scale division can be entered, then one of the following conditions must be met:

(1) A tare value that is not consistent with the displayed scale division is automatically rejected, or Yes ☐ No ☐ N/A ☐

(2) The tare weight entry must be rounded to the nearest displayable scale division. Yes ☐ No ☐ N/A ☐

C. If a device will accept a tare entry in excess of scale capacity, a net weight indication must be a negative value, or the net display must be blank or display an error symbol. Yes ☐ No ☐ N/A ☐

17. Stored Tare

Stored tare is the tare for a vehicle or a container that is retained in the memory of the scale or attached device and is repeatedly used for multiple weighing operations. Stored tare may not be acceptable in some jurisdictions and is not acceptable in all applications. The suitability of this operational feature is determined by the enforcement policy of each jurisdiction.

Each tare value shall be verified before being used for the first time in a series of weighing operations. It is recommended that the time and date the tare was taken also be recorded.

18. RFI/EMI Environment

Code Reference: G-UR.1.2.

21.1.	The equipment shall be suitable for the environment in which it is intended to be used, including resistance to electromagnetic and radio-frequency interference generated by electromechanical equipment, portable hand-held radio transmitters and citizen's band transmitting equipment (if normally used at the site of installation), the printer, etc. (NCWM/SMA RFI/EMI Field Test Procedures to be used where applicable).	Yes ☐ No ☐ N/A ☐

19. Motion Detection

Code References: S.2.1.2., S.2.5.1., and G-S.2.

A digital electronic device must have a motion detection capability that prevents the device from zeroing (semi-automatic zero) or tare (semi-automatic tare) part of a load when the semi-automatic zero or tare key is activated at the same time that a load is added, changed, or removed from the scale.

A digital electronic scale equipped with a printer must have a motion detection capability that prevents the scale from printing weight values before the weight display has stabilized within specified limits. This reduces the possibility of recording incorrect weight values. The limits for motion detection are:(a) plus or minus 3 scale divisions for axle load, railway track, vehicle scales, livestock, and hopper (other than grain hopper) scales with a capacity exceeding 22 000 kg (50 000 lb); and(b) plus or minus 1 scale division for all other scales.

The test procedure given below is used to test the effectiveness of motion detection for printing, semi-automatic zero, semi-automatic tare, and storing a weight value in a memory register.

Test Procedure

Small Capacity Scales

Place a load within the weighing range on the scale platform and allow time for the scale indication to stabilize. Disturb the load by hand to induce "motion" to the scale indications to a peak magnitude greater than 10d. While disturbing the load, attempt to activate the zero operation and allow the oscillations to settle out. The scale may eventually zero the load or may reject the command. Under no circumstances may the zeroed value differ from the value obtained under static conditions (zero) by more than 1d.

This test should be repeated at least five times for small loads and for loads near capacity. Repeat the above test procedure for the print key, tare key(s), and any stored weight keys.

In addition to hand manipulation of the load, a load of at least 10d may be applied or removed as a step function while activating the zero, tare, memory, or print keys when the weight is added or removed.

Test Procedure

Intermediate and Large Capacity Scales

For higher capacity scales, it may not be convenient or practical to disturb the load by hand. A load of greater than 15d may be applied or removed while activating the zero, tare, stored weight, or print keys. It is important to insure that peak oscillations of greater than 15d are induced. These tests can usually be performed as test weights are being placed on or removed from the scale platform.

Since this is primarily an instrument test, a low capacity load cell may be connected to the instrument and a weight applied to the load cell in a convenient manner. The instrument, load cell, and weight must be chosen to allow the convenient application of weights to the load cell representing a low, middle, and full instrument display. Push- button zero, semi-automatic tare, memory, other stored weight keys, and print key tests will be conducted as described before, insuring peak disturbances of greater than 15d. Indicated and recorded values must be within 3 divisions (3d) of the value obtained under static conditions for scales of more than 2000 kg (5000 lb) capacity. Indicated and recorded values must be within 1d of the value obtained under static conditions for all other scales. All recorded values shall be within applicable tolerances.

A.	Semi-automatic zero complies with motion detection requirements.	Yes ☐ No ☐ N/A ☐
B.	Semi-automatic tare complies with motion detection requirements.	Yes ☐ No ☐ N/A ☐
C.	Stored weight key(s) comply with motion detection requirements.	Yes ☐ No ☐ N/A ☐
D.	Recorded (printed) values comply with motion detection requirements.	Yes ☐ No ☐ N/A ☐

APPENDIX A
Marking Requirements

Since the United States permits indicating and weighing/load-receiving elements to be evaluated separately with different indicating and weighing/load-receiving elements (W/LRE) to be assembled at the time of scale installation, additional marking requirements were adopted in 1987 for these types of devices. To facilitate the proper installation of equipment and to permit verification by the enforcement official, a weighing/load-receiving element not permanently attached to an indicating element must be marked with:

1) its accuracy class,
2) the maximum number of scale divisions, n_{max}, and
3) minimum verification scale division, e_{min}, for which the W/LRE complies with the applicable requirements.

W/LRE's not permanently attached to an indicating element shall be clearly and permanently marked with:

1.	The nominal capacity of the weighing/load-receiving element.	Yes ☐ No ☐ N/A ☐
2.	Its accuracy class. Indicate class:	Yes ☐ No ☐ N/A ☐
3.	The maximum number of scale divisions for which it complies with requirements. The preferred abbreviation or symbol is n_{max}.	Yes ☐ No ☐ N/A ☐
4.	The minimum verification scale division for which it complies with requirements. The preferred abbreviation or symbol is e_{min}.	Yes ☐ No ☐ N/A ☐
5.	The weighing/load-receiving element shall be marked with the operating temperature range if the temperature range is other than 14 °F to 104 °F (-10 °C to 40 °C).	Yes ☐ No ☐ N/A ☐
6.	The lettering must be permanent. Record the grade for the permanence of markings: (Use procedures in section 1.)	Yes ☐ No ☐ N/A ☐
7.	If the information is placed on a badge or plate, the badge or plate must be permanently attached to the device. If a badge, label, or plate made of a metal or plastic is used, then it must be riveted, welded, or attached to the scale by an adhesive so that a tool is required to remove it (bolts or removable screws are not acceptable).	Yes ☐ No ☐ N/A ☐
8.	The information must be mounted on a protected surface such as the side of the weighing/load-receiving element, behind a ramp or under a cover plate. Access to the marking should be available with minimum effort.	Yes ☐ No ☐ N/A ☐

Location of the required identification information:

9.	The information must be on a surface that is an integral part of the chassis.	Yes ☐ No ☐ N/A ☐
10.	The identification information for the weighing/load-receiving elements of vehicle, axle-load, livestock, and railway track scales shall be located:	Yes ☐ No ☐ N/A ☐
(a)	Near the point where the signal leaves the weighing/load-receiving element. This would be the transverse lever on a mechanical scale.	Yes ☐ No ☐ N/A ☐
(b)	The information shall be on or near the junction box nearest the point where the signal leaves the scale on an above-ground scale.	Yes ☐ No ☐ N/A ☐

APPENDIX B
Philosophy for Sealing

Principles for Determining Features to be Sealed

1. The need to seal some features depends upon:

   (a) the ease with which the feature or the selection of the feature can be used to facilitate fraud; and

   (b) the likelihood that the use of the feature will result in fraud not being detected.

2. Features or functions which are routinely used by the operator as part of device operation, such as setting the unit prices on gasoline dispensers and maintaining unit prices in price look-up codes stored in memory, are not sealable parameters and shall not be sealed.

3. If a parameter (or set of parameters) selection would result in performance that would be obviously in error, such as the selection of parameters for different countries, then it is not necessary to seal the selection of these features.

4. If individual device characteristics are selectable from a "menu" or a series of programming steps, then access to the "programming mode" must be sealable.

5. If a device must undergo a physical act, such as cutting a wire and physically repairing the cut to reactivate the parameter, then this physical repair process would be considered an acceptable way to select parameters without requiring a physical seal or an audit trail.

Typical Features and Parameters to be Sealed

The following table provides examples of configuration and calibration parameters that are to be sealed. The examples are provided for guidance and are not intended to cover all possible parameters.

Calibration Parameters: Calibration parameters are those parameters whose values are expected to change as a result of accuracy adjustments.

Configuration Parameters: Configuration parameters are those parameters whose values are expected to be entered once only and not changed after all initial installation settings have been made.

A junction box that contains calibration (or configuration) adjustments must have provision for sealing.

APPENDIX C
Sleep Mode/Screen Saver

If the power or battery save mode only turns off the display to save power, the feature is considered to be a sleep mode and should be evaluated using the screen saver/sleep mode criteria.

The function of a screen saver, sleep mode and power save feature can be metrologically significant because zero information may not be available to the customer and operator at the start of a transaction.

NIST Handbook 44 Scales Code paragraph S.1.1. (c) Zero Indication. states that the zero-balance condition can be indicated by other than a continuous digital zero indication provided that effective means are provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition.

The zero indication must be defined if the zero condition of the scale is represented by other than a digital representation. In this case, a legend must be included as part of, or adjacent to the display to indicate that indications other than a digital zero (e.g. dashes in display or other indications such as scrolling messages) indicate the scale is on zero (See also General Code Reference G-S.6. Marking Operational Controls, Indications, and Features).

The following are examples of acceptable screen saver/sleep mode operations. Checks the method(s) used by the scale or describe the screen saver, sleep mode, or power save feature operation if it is not one of the examples listed below.

- The primary weight indication is continuously displayed while in the screen saver/sleep mode.
- A clearly defined zero annunciator that is active only when the scale is in a zero gross load condition.
- Activation of the sleep or battery/power save mode turns off the scale requiring the operator to turn on the scale before a weighing operation can be performed.
- Activation of the sleep or battery/power save mode only turns off the primary weight display or the primary weight display is replaced by scrolling messages or dashes. The method of indicating a zero balance condition must be clearly defined as the zero indication as required by General Code paragraph G.S.6. Marking Operational Controls, Indications, and Features. The legend must state, “Scrolling messages indicates scale is at zero” or similar statement.

If the scale goes off of zero, the scale must either:

- return to the active weight display, or
- prevent the initiation of a weighing transaction until the scale has returned to a digital zero indication.

Comments:

1.	The scale shall not enter the screen saver/sleep mode when the scale is at other than a zero load condition unless the scale is automatically powered off.	Yes ☐ No ☐ N/A ☐

	To verify that power has been turned off during the sleep mode, apply a test load on the scale and monitor the condition of the display until the screen saver/sleep mode is enabled and the display goes blank. Changing the load on the scale and depressing operator or customer-operated keys cannot activate the display.	
	Turned the scale back on with the power switch/button weight on the scale, the scale must return to zero, or display an error code or other meaningless information.	
	As soon as the scale is ready to weigh, check the "warm-up" accuracy of the scale by placing a test load of one-half scale capacity (or maximum available weight if one-half capacity is not available). The weight indication shall be within applicable tolerance.	Yes ☐ No ☐ N/A ☐
2.	If the primary weight display disappears in the screen saver/sleep mode with the scale at zero and the power to the scale is not automatically shut off, the display must comply with a or b below:	Yes ☐ No ☐ N/A ☐
	(a) The zero indication or zero annunciator must be displayed, or defined if zero is indicated by other than a digital zero indication or annunciator.	Yes ☐ No ☐ N/A ☐
	If a legend is used to define zero, it must be included adjacent to the display to indicate that the information (dashes, scrolling message, and etc.) indicate the scale is on zero.	Yes ☐ No ☐ N/A ☐
	The screen saver/sleep mode shall be deactivated and the continuous weight display automatically returns under the following conditions unless means are provided to inhibit a weighing transaction until the scale has returned to a digital zero indication:	Yes ☐ No ☐ N/A ☐
	The scale drifts above zero	Yes ☐ No ☐ N/A ☐
	Weight is added to the scale	Yes ☐ No ☐ N/A ☐
	The scale drifts below zero	Yes ☐ No ☐ N/A ☐
	The scale is in an overcapacity condition.	Yes ☐ No ☐ N/A ☐
	(b) Means are provided to inhibit a weighing transaction until the operator has returned the scale to a digital zero indication.	Yes ☐ No ☐ N/A ☐

APPENDIX D
Indicating and Recording elements - General

Wireless Communication Test Criteria

1. As used in this section, a wireless communications device may include weighing elements, load-receiving elements, indicating elements, recording elements (output), etc. with integral or separate add-on communication devices capable of transmitting and/or receiving metrological information between elements.
In order for the wireless communication capability to be listed on the Certificate, the following procedures shall be used to evaluate indicating elements that communicate digital weight and other information from separable load-receiving elements (LRE) or other peripheral equipment (i.e., PC or remote control) by means of a radio transmitter/receiver or other wireless communication devices. At least two (2) complete devices (e.g. crane scales) or a combination of separable indicating, LRE, and recording elements shall be evaluated to ensure:

(a) There is no interference from one complete device to another of the same type. Yes ☐ No ☐ N/A ☐

(b) The signal from a weighing/load-receiving element is sent to the **appropriate** (correct) indicating element. Yes ☐ No ☐ N/A ☐

(c) The indicator displays an error message or displays meaningless information that could not be mistaken for a valid weight indication, when the signal from the weighing/load-receiving element (or the metrologically significant peripheral equipment) is interrupted or blocked by all of the following actions:

(1) -turning the power off to the weighing/load-receiving element , Yes ☐ No ☐ N/A ☐

(2) -turning the power off to the metrologically significant peripheral equipment, Yes ☐ No ☐ N/A ☐

(3) -attempting to block the signal with a steel plate, or Yes ☐ No ☐ N/A ☐

-moving the indicator away from the W/LRE, or

-moving the indicator away from the metrologically significant peripheral equipment.

Record the actions above (e.g., distance) at which an accurate indication is maintained:

This information is for reference purposes and will not be listed or reported on the CC.

(d)	If the indicating element can be connected to more than one W/LRE at the same time, by means of a radio link or other wireless means, the indicating element will be evaluated with at least 2 weighing/load-receiving elements (placed side by side) with the wireless communication capability and shall meet all the same requirements as an indicating element using physical connection to the weighing/load-receiving elements.	Yes ☐ No ☐ N/A ☐
(e)	If more than one indicating element can be connected to one single weighing/load-receiving element at the same time using the wireless communication method, the evaluation will be performed with at least two (2) indicating elements (placed side by side) and connected to the W/LRE using the wireless communication method and shall meet all the same requirements as indicating elements using physical connection to the weighing/load-receiving element.	Yes ☐ No ☐ N/A ☐
(f)	If the wireless communication is battery powered, the device continues to perform within applicable tolerance when the DC voltage to the device is lowered to the lowest DC voltage where a weight display is available and raised to the highest voltage recommended by the device manufacturer. If the manufacturer does not specify the highest DC voltage, the device will be tested with a DC power supply equal to the nominal DC voltage. The device will then be tested with a DC power supply equal to the nominal DC voltage plus 10 percent. The low power supply testing will be conducted at the maximum range (distance) determined at the nominal DC voltage which an accurate indication is maintained.	Yes ☐ No ☐ N/A ☐

APPENDIX E

Batch Plant Considerations

1. Gate Position

Code Reference: S.3.1.

1.1.	The operator can see the position of the gates leading directly to and from the weigh hopper. Indicate the method provided.	Yes ☐ No ☐ N/A ☐

2. Interlocks

Code Reference: S.3.2.

Proper weighing operation(s) and recording of weight values shall be ensured.

Each weighing system shall have operating interlocks to provide for the following:

2.1.	Product cannot be cycled and weighed if the recording element is disconnected or subject to a power loss.	Yes ☐ No ☐ N/A ☐
2.2.	If either of the gates leading directly to or from the weigh hopper is open, the recording element cannot print a weight.	Yes ☐ No ☐ N/A ☐
2.3.	When a "low paper" sensor is provided, it is activated.	Yes ☐ No ☐ N/A ☐
2.4.	The system will operate only in the proper sequence in all modes of operations, according to weights and measures requirements and the manufacturer's written instructions.	Yes ☐ No ☐ N/A ☐
2.5.	If the weigh hopper is overfilled, the feed gate closes; an alarm is activated; and weighing is inhibited.	Yes ☐ No ☐ N/A ☐
2.6.	If the lower garner or surge bin is overfilled, the weigh hopper bin cannot be closed; an alarm is activated; and weighing is inhibited.	Yes ☐ No ☐ N/A ☐

3. Multiple Load-receiving Elements

Code Reference: S.4.3.

A system with a single indicating or recording element, or a combination indicating and recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit activating any load-receiving element (or elements) not in use. It shall also have automatic means to indicate and record clearly and definitely which load-receiving element (or elements) is in use.

Can the indicating or recording element be coupled to two or more load-receiving elements with independent weighing systems?

If **yes**, the following conditions must be met:

3.1.	The indicating element shall provide a clear and automatic indication of which load- receiving element is in use.	Yes ☐ No ☐ N/A ☐
3.2.	The recording element shall automatically record which weighing element is in use and identify the recorded information as the scale identification.	Yes ☐ No ☐ N/A ☐
3.3.	The system shall prohibit the activation of any load-receiving element not in use.	Yes ☐ No ☐ N/A ☐

4. Tare

Tare operations are prohibited for batch controllers.

5. Manual Entries

Manual entries are prohibited for batch controllers.

5.1. Manual entries can only be used when the controller is not connected and the load is being manually batched.

APPENDIX F
Multiple Load Receiving Elements

Code Reference: S.4.3.

For Batch controllers, refer to Appendix F

If indicators or printers are connected to two or more weighing/load-receiving elements, information from one weighing/load-receiving element must not interfere with the indication or printing of information from the other elements(s). When multiple weighing/load-receiving elements are connected to a single indicator or printer, the weighing/load-receiving element in use shall be automatically indicated and recorded.

This does not prohibit scales from providing summed indications for more than one weighing/load-receiving element, but the indicated and recorded values must clearly indicate that the weight value is a summed value and which weighing/load-receiving elements were in use to obtain the summed value. An exception to this requirement is given to mechanical bench and counter scales because the weighing/load-receiving elements and the indicator are generally in close proximity. Consequently, a customer can see which weighing/load-receiving element is in use and the associated weight values being indicated.

Can the indicating or recording element be coupled to two or more load-receiving elements with independent weighing systems? **Yes** ☐ **No** ☐

If yes, then the following conditions must be met:

1.	The system shall prohibit the activation of any load-receiving element not in use.	Yes ☐ No ☐ N/A ☐
2.	The recording element shall automatically record which weighing/load-receiving element is in use for each weight value and identify the recorded information as the scale identification. If numbers are used to identify the scales, they must not result in an erroneous weight reading. (Example of unacceptable indication: Scale 114 000 lb.)	Yes ☐ No ☐ N/A ☐
3.	The indicating element shall provide a clear and automatic indication of which load-receiving element is in use.	Yes ☐ No ☐ N/A ☐
4.	The weighing/load-receiving elements must be marked to correspond to the display indications.	Yes ☐ No ☐ N/A ☐
5.	If a scale also serves as an indicator for a separate weighing/load-receiving element, then the indicator function must meet the influence factors requirements at 0.7 times the scale tolerance.	Yes ☐ No ☐ N/A ☐

A weighing system may have a single indicating element for two or more weighing/load-receiving elements. The weight values for the weighing/load-receiving elements may be displayed individually or as a summed value for two or more elements. These conditions may exist for vehicle scales utilizing three elements to determine axle loads or on combinations of wheel-load weighers. When a system can display weights for individual elements, the number of scale divisions for a "scale" is based upon the capacity and division value for each individual weighing/load-receiving element. When only a summed weight value is displayed, the number of scale divisions in the scale is based upon the summed indication. The proper operation and capacity marking of these systems is described below:

6. An indication of a summed weight value shall include an over-capacity indication and a behind-zero indication whenever any of the weighing/load-receiving elements are in either of these conditions. This applies whenever any or all of the weighing/load-receiving elements are empty or loaded, but not to indicated negative values for a behind-zero balance condition. Yes ☐ No ☐ N/A ☐

7. Zero-Setting Mechanism

There must be means for setting each weighing/load-receiving element to a zero balance indication. The zero-setting mechanism shall not operate independently on a summed weight indication when values for individual weighing/load-receiving elements can be displayed.

8. Tare mechanism.

(a) Individual indications for each load-receiving element - no summed indication. Each load-receiving element shall be evaluated as an independent scale and must meet appropriate requirements Yes ☐ No ☐ N/A ☐

(b) Individual indications for each load-receiving element - with summed indication. If the instrument has the ability to select individual load-receiving elements and sum, each must operate within the guidelines defined in section 34.8.1. or 34.8.3. Yes ☐ No ☐ N/A ☐

(c) Sum only indication. The summed display shall be evaluated as an individual scale and must meet appropriate requirements.

9. The capacity, by scale division value, shall be marked adjacent to the weight display in a manner dependent upon the particular scale installation as follows:

(a) When all weighing/load-receiving elements have the same capacity and the load on each can be displayed independently and summed, the marking shall be the capacity and scale division value of an individual weighing/load-receiving element and the summed capacity. Yes ☐ No ☐ N/A ☐

(b) When all weighing/load-receiving elements have the same capacity and only the summed weight values can be displayed, the capacity and scale division value for the summed capacity shall be marked. Yes ☐ No ☐ N/A ☐

(c) When a summed value for all weighing/load-receiving elements and a summed value from any two elements can be displayed independently, the capacity and scale division value shall be marked for both the total summed capacity and the capacity of the two elements. Yes ☐ No ☐ N/A ☐

(d) When the weighing/load-receiving elements have different capacities and the load on each can be displayed independently, the capacity of each shall be marked. Yes ☐ No ☐ N/A ☐

APPENDIX G

Excerpt from DMS Notice D -- 08 – 4, July 29, 2008

Most Common Acceptable Abbreviations for Units

Name of Unit	Common Use Symbol	Representation		
		Lower Case	Upper Case	Acceptable
assay ton	AT	n/a	AT	
barrel	bbl	bbl	n/a	
bushel	bu	bu	n/a	
carat	c	c	n/a	
chain	ch	ch	n/a	
cord	cd	cd	n/a	
cubic foot	ft^3	ft^3	FT^3	cu ft
cubic inch	in^3	in^3	IN^3	cu in
cubic yard	yd^3	yd^3	YD^3	cu yd
dram avdp	dr avdp	dr avdp	n/a	
dry pint	dry pt	dry pt	n/a	
dry quart	dry qt	dry qt	n/a	
fluid dram	fl dr	fl dr	n/a	fl dr
foot	ft	ft	FT	
furlong	fur	fur	n/a	
gallon	gal	gal	GAL	
gill	gi	gi	n/a	
grain	gr	gr	n/a	
gross hundredweight	gross cwt	gross cwt	GROSS CWT	
inch	in	in	IN	
link	li	li	n/a	
liquid quart	qt	qt	QT	
minim	min	min	Z	
ounce	oz	oz	OZ	
ounce troy	oz t	oz t	OZ T	
peck	pk	pk	n/a	
pennyweight	dwt	dwt	DWT	
pint	pt	pt	PT	
pound	lb	lb	LB	
rod	rd	rd	n/a	
short hundredweight	net cwt	net cwt	n/a	
square foot	ft^2	ft^2	FT^2	sq ft
square inch	in^2	in^2	IN^2	sq in
square mile	mi^2	mi^2	n/a	sq mi
square rod	rd^2	rd^2	n/a	sq rd
square yard	yd^2	yd^2	YD^2	sq yd
ton (net or short)	ton	ton	n/a	ton
pound troy or apothecary	lb t or lb ap	lb t or lb ap		
yard	yd	yd	YD	

***NOTE**: If the name of a unit is more appropriate than the unit symbol, the name of the unit should be spelled out in full.*