FIELD TRAINING MANUAL

Retail Computing Scales

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

NCWM Field Training Manual

Retail Computing Scales

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Setting the United States Standards for Weights and Measures

The National Conference on Weights and Measures (NCWM) is a professional nonprofit association of state and local Officials, federal agencies, manufacturers, retailers, and consumers. NCWM has developed national weights and measures standards since 1905. The organization brings the right interests together to keep pace with innovative advancements in the marketplace.

Our Mission

Ensuring Equity and Uniform Standards in a Changing Marketplace

We develop uniform and equitable weights and measures standards to:

- Promote commerce and fair competition by leveling the playing field
- Ensure consumers "get what they pay for"
- Foster confidence in marketplace transactions
- Advance economic growth

Our Vision

Making Every Marketplace Transaction Fair and Equitable

PREAMBLE

The National Conference on Weights and Measures, Inc. (NCWM) Retail Computing Scale Manual is based on the 2022 Edition of the National Institute of Standards and Technology Handbook 44 (HB-44).

This Handbook does not replace HB-44. It serves as a training tool and reference handbook for Officials when inspecting or placing commercial devices into service. It provides key elements of HB-44 and explanations that enable uniform interpretation.

The Handbook details applicable HB-44 code requirements followed by key points when helpful, to provide additional instruction and information.

Not all jurisdictions adopt the most current edition of HB-44 or in its entirety. Refer to the edition of HB-44, statutes and regulations adopted by your jurisdiction when considering enforcement action.

INTRODUCTION TO HB-44

The Introduction section of HB-44 contains important information about using the handbook and is reproduced here. It is recommended to read it before conducting inspections.

A. Source.

The specifications, tolerances and other technical requirements in this handbook comprise all of those adopted by the National Conference on Weights and Measures, Inc. (NCWM). Contact NCWM at:

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www.ncwm.com

The NCWM is supported by the National Institute of Standards and Technology (NIST), which provides its Executive Secretary and publishes some of its documents. NIST also develops technical publications for use by weights and measures agencies; these publications may subsequently be endorsed or adopted by NCWM or its members.

NCWM recommends all of the specifications, tolerances and other technical requirements given herein for official promulgation in and use by the states in exercising their control of commercial weighing and measuring apparatus. A similar recommendation is made with respect to the local jurisdictions within a state in the absence of the promulgation of specifications, tolerances, and other technical requirements at the state level.

(Amended 2015)

B. Purpose.

The purpose of these technical requirements is to eliminate from use, weights and measures and weighing and measuring devices that give readings that are false, that are of such construction that they are faulty (that is, that are not reasonably permanent in their adjustment or will not repeat their indications correctly), or that facilitate the perpetration of fraud, without prejudice to apparatus that conforms as closely as practicable to the official standards.

C. Amendments.

Proposed amendments to NIST Handbook 44 are deliberated and developed by NCWM's Committee on Specifications and Tolerances before presentation to the general membership for a vote. In some instances, amendments that significantly affect other NIST Handbooks may be processed jointly by two or more committees.

Amendments to the handbooks are made in accordance with NCWM procedures and policies. The process begins at the regional weights and measures association meetings in the fall of each year

and is culminated at the NCWM Annual Meeting in July. After passing through one or more of the regional associations the proposed amendment is placed on the agenda of the appropriate NCWM committee for consideration at NCWM's Interim Meeting in January and after final deliberation and development by the committee the amendment may be presented to the membership for a vote at the annual NCWM meeting in July. NCWM policy provides for exceptions to the process to accommodate urgent or priority items. NIST staff provides technical assistance and advice throughout the process.

The policy is available on the NCWM website at **www.ncwm.com**. For information on the regional weights and measures associations, visit **www.ncwm.com/meetings/regions**.
(Amended 2015)

D. System of Paragraph Designation.

In order that technical requirements of a similar nature, or those directed to a single characteristic, may be grouped together in an orderly fashion, and to facilitate the location of individual requirements, the paragraphs of each code are divided into sections. Each section is designated by a letter and a name, and each subsection is given a letter-number designation and a side title.

The letter that appears first in a paragraph designation has a specific meaning, as follows:

G. The letter G is a prefix and indicates that the requirement is part of the General Code.

A. Application. These paragraphs pertain to the application of the requirements of a code.

S. Specification. These paragraphs relate to the design of equipment. Specification paragraphs are directed particularly to manufacturers of devices.

N. Note. These paragraphs apply to the official testing of devices.

T. Tolerance. Tolerances are performance requirements. They fix the limit of allowable error or departure from true performance or value.

Sensitivity. The sensitivity requirements, applicable only to nonautomatic-indicating scales, are performance requirements and are lettered with a "T."

UR. User Requirement. These paragraphs are directed particularly to the owner and operator of a device. User requirements apply to the selection, installation, use, and maintenance of devices.

D. Definitions of Terms. A definitions section appears in Appendix D to provide the definition of the terms having a special meaning.

The numerical designation after a letter follows the decimal system of paragraph identification that fixes both the relationship and the limitation of the requirements of the paragraph. For example, in the Scales Code, under Specifications, the following numerical designations occur:

S. Specifications

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

S.1.1. Zero Indication.
  S.1.1.1. Digital Indicating Elements.
  S.1.1.2. No-Load Reference Value.
S.1.2. Value of Scale Division Units.
  S.1.2.1. Digital Indicating Scales.
S.1.3. Graduations.
  S.1.3.1. Length.
  S.1.3.2. Width.
  S.1.3.3. Clear Space Between Graduations.

In this example, paragraphs S.1.1., S.1.2., and S.1.3. are directed and limited to paragraph S.1., which pertains to the design of indicating and recording elements and of recorded representations. Paragraphs S.1.1.1. and S.1.1.2. are directly related to each other, but they are limited to the design of zero indication. Likewise, paragraphs S.1.3.1., S.1.3.2., and S.1.3.3. are directly related to each other, but they are limited to the design of graduations.

This handbook conforms to the concept of primary use of SI (metric) measurements recommended in the Omnibus Trade and Competitiveness Act of 1988 by citing SI metric units before U.S. customary units where both units appear together and placing separate sections containing requirements for metric units before corresponding sections containing requirements for customary units. Occasionally, a paragraph or table carries the suffix "M" because the requirement in SI units is shown as a separate statement, rather than combined with the U.S. customary units. In these few instances, separate requirements were judged to be more easily understood than attempting to combine SI and U.S. customary units in a single paragraph or table. In some cases, however, trade practice is currently restricted to the use of customary units; therefore, some requirements in this handbook will continue to specify only customary units until the Conference achieves a broad consensus on the permitted metric units.

E. Classification of Requirements.

The classification of requirements into "retroactive" and "nonretroactive" status is made in order that the requirements may be put into force and effect without unnecessary hardship and without wholesale condemnation of apparatus. Retroactive requirements are enforceable with respect to all equipment and are printed in upright roman type. Nonretroactive requirements are those that, while clearly desirable, are not so vital that they should at once be enforced with respect to all apparatus. Nonretroactive requirements are printed in ***italic type.***

It is not expected that, after their promulgation in a given jurisdiction, nonretroactive requirements will always remain nonretroactive. It is entirely proper that a Official, following a careful analysis of existing conditions, fix reasonable periods for the continuance of the nonretroactive application of particular requirements, after which such requirements will become retroactive. These periods should be long enough to avoid undue hardship to the owners or operators of apparatus and, in the case of some requirements, should approximate the average useful life of the apparatus in question.

In order that all interested parties may have timely and ample notice of impending changes in the status of requirements, the following procedure is suggested for the official who plans to change the classification of requirements. If sufficient data are available to make such action feasible, publish in combination with the codes themselves the date or dates at which nonretroactive requirements are to become retroactive. In other cases, give equally effective notice at the earliest practicable date.

A nonretroactive requirement, in italic type, will indicate the year from which it should be enforced and, in some cases, the date the requirement shall be changed to retroactive status. For example, *[Nonretroactive as of 1978 and to become retroactive on January 1, 1985]*. As a general rule, each nonretroactive requirement is reviewed after it has been in effect for 10 years to determine the appropriateness of its nonretroactive status.

F. Using the Handbook.

Handbook 44 is designed to be a working tool for federal, state, and local Officials, the equipment manufacturers, installers, and service agencies/agents. As noted in Section 1.10. General Code paragraph G-A.1. Commercial and Law-Enforcement Equipment, applicable portions of Handbook 44 may be used by the Official to test noncommercial weighing and measuring equipment upon request. Additionally, applicable language in Handbook 44 may be cited as a standard in noncommercial applications, for example, when the handbook is referenced or cited as part of a quality system or in multiple-party contract agreements where noncommercial weighing or measuring equipment is used.

The section on Fundamental Considerations (Appendix A) should be studied until its contents are well known. The General Code, with general requirements pertaining to all devices, obviously must be well known to a user of the handbook. The makeup of the specific codes, the order of paragraph presentation, and particularly paragraph designation are worthy of careful study. It is not deemed advisable for a user to attempt to commit to memory tolerances or tolerance tables, even though these are used frequently. For the handbook to serve its purpose, it should be available when any of its requirements are to be applied. Direct reference is the only sure way to apply a requirement properly and to check whether other requirements may be applicable.

This handbook supplies criteria which enable the user to determine the suitability, accuracy, and repetitive consistency of a weighing or measuring device, both in the laboratory and in the field. However, not all code sections can be appropriately applied in both settings. Since some sections are designed to be applied specifically to tests performed under laboratory conditions, it would be impractical or unrealistic to apply them to field tests. Not all tests described in the "Notes" section of the handbook are required to be performed in the field as an official test. An inspector may officially approve or reject a device which has been tested in accordance with those sections applicable to the type of test being conducted.

PURPOSE OF NCWM RETAIL COMPUTING SCALE MANUAL

The purpose of this NCWM Manual is to provide the technical requirements of HB-44 to properly test and inspect class III retail computing scales. The Manual is also intended to be used as a training tool for Officials to promote uniformity and strengthen weights and measures throughout the United States.

GENERAL CONSIDERATIONS AND PRINCIPLES

Mission: The mission of an Official should be to inspect and test weighing and measuring devices to ensure that the device is correct (accurate and meets all applicable HB-44 specifications) and every ***marketplace transaction is fair and equitable.***

Protecting the consumer and ensuring equity in the marketplace is the cornerstone of a weights and measures program. Consumers depend on the Official to ensure they receive the amount of product for which they have paid, and businesses to ensure equity and fair competition.

Inspection vs Test: This mission is accomplished through inspecting the entire chain of the transaction, and the entire measuring system. Enforcement and education are the two primary tools used by the Weights and Measures Agency and inspector in carrying out their duties.

(See appendix B for more information on inspecting vs testing).

Documentation: During weights and measures training, the trainer, a seasoned Official, shared important and lasting wisdom with the group. He said, "when you write your report, keep in mind that your report one day may end up in court. Document thoroughly everything that would be important if you had to rely on that report to prove your case in court. ***If you didn't document it, it didn't happen."***

Documenting events and violations is not only important for legal reasons, but also because it creates a history for the business and other Officials.

Appendix A of NIST HB-44 contains the fundamental considerations associated with enforcement of HB-44 codes and other fundamental considerations. It is reproduced here, and Officials are highly encouraged to read this section before proceeding.

Fundamental Considerations Associated with the Enforcement of H- 44 Codes

1. Uniformity of Requirements

1.1. National Conference Codes. – Weights and measures jurisdictions are urged to promulgate and adhere to the National Conference codes, to the end that uniform requirements may be in force throughout the country. This action is recommended even though a particular jurisdiction does not wholly agree with every detail of the National Conference codes. Uniformity of specifications and tolerances is an important factor in the manufacture of commercial equipment. Deviations from standard designs to meet the special demands of individual weights and measures jurisdictions are expensive, and any increase in costs of manufacture is, of course, passed on to the purchaser of equipment. On the other hand, if designs can be standardized by the manufacturer to conform to a single set of technical requirements, production costs can be kept down, to the ultimate advantage of the general public. Moreover, it seems entirely logical that equipment that is suitable for commercial use in the "specification" states should be equally suitable for such use in other states.

Another consideration supporting the recommendation for uniformity of requirements among weights and measures jurisdictions is the cumulative and regenerative effect of the widespread enforcement of a single standard of design and performance. The enforcement effort in each jurisdiction can then reinforce the enforcement effort in all other jurisdictions. More effective regulatory control can be realized with less individual effort under a system of uniform requirements than under a system in which even minor deviations from standard practice are introduced by independent state action.

Since the National Conference codes represent the majority opinion of a large and representative group of experienced regulatory officials, and since these codes are recognized by equipment manufacturers as their basic guide in the design and construction of commercial weighing and measuring equipment, the acceptance and promulgation of these codes by each state are strongly recommended.

1.2. Form of Promulgation. A convenient and very effective form of promulgation already successfully used in a considerable number of states is promulgation by citation of National Institute of Standards and Technology Handbook 44. It is especially helpful when the citation is so made that, as amendments are adopted from time to time by the National Conference on Weights and Measures, these automatically go into effect in the state regulatory authority. For example, the following form of promulgation has been used successfully and is recommended for consideration:

> The specifications, tolerances, and other technical requirements for weighing and measuring devices as recommended by the National Conference on Weights and Measures and published

in the National Institute of Standards and Technology Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," and supplements thereto or revisions thereof, shall apply to commercial weighing and measuring devices in the state.

In some states, it is preferred to base technical requirements upon specific action of the state legislature rather than upon an act of promulgation by a state officer. The advantages cited above may be obtained and may yet be surrounded by adequate safeguards to insure proper freedom of action by the state enforcing officer if the legislature adopts the National Conference requirements by language somewhat as follows:

The specifications, tolerances, and other technical requirements for weighing and measuring devices as recommended by the National Conference on Weights and Measures shall be the specifications, tolerances, and other technical requirements for weighing and measuring devices of the state except insofar as specifically modified, amended, or rejected by a regulation issued by the state (insert title of enforcing officer).

2. Tolerances for Commercial Equipment

2.1. Acceptance and Maintenance Tolerances. – The official tolerances prescribed by a weights and measures jurisdiction for commercial equipment are the limits of inaccuracy officially permissible within that jurisdiction. It is recognized that errorless value or performance of mechanical equipment is unattainable. Tolerances are established, therefore, to fix the range of inaccuracy within which equipment will be officially approved for commercial use. In the case of classes of equipment on which the magnitude of the errors of value or performance may be expected to change as a result of use, two sets of tolerances are established: acceptance tolerances and maintenance tolerances.

Acceptance tolerances are applied to new or newly reconditioned or adjusted equipment and are smaller than (usually one-half of) the maintenance tolerances. Maintenance tolerances thus provide an additional range of inaccuracy within which equipment will be approved on subsequent tests, permitting a limited amount of deterioration before the equipment will be officially rejected for inaccuracy and before reconditioning or adjustment will be required. In effect, there is assured a reasonable period of use for equipment after it is placed in service before reconditioning will be officially required. The foregoing comments do not apply, of course, when only a single set of tolerance values is established, as is the case with equipment such as glass milk bottles and graduates, which maintain their original accuracy regardless of use, and measure-containers, which are used only once.

2.2. Theory of Tolerances. – Tolerance values are so fixed that the permissible errors are sufficiently small that there is no serious injury to either the buyer or the seller of commodities, yet not so small as to make manufacturing or maintenance costs of equipment disproportionately high. Obviously, the manufacturer must know what tolerances his equipment is required to meet, so that he can manufacture economically. His equipment must be good enough to satisfy commercial needs but should not be subject to such stringent tolerance values as to make it unreasonably costly, complicated, or delicate.

2.3. Tolerances and Adjustments. – Tolerances are primarily accuracy criteria for use by the regulatory official. However, when equipment is being adjusted for accuracy, either initially or following repair or official rejection, the objective should be to adjust as closely as practicable to zero error. Equipment owners should not take advantage of tolerances by deliberately adjusting their equipment to have a value, or to give performance, at or close to the tolerance limit. Nor should the repair or service personnel bring equipment merely within tolerance range when it is possible to adjust closer to zero error.[1]

3. Testing Apparatus

3.1. Adequacy.2 – Tests can be made properly only if, among other things, adequate testing apparatus is available. Testing apparatus may be considered adequate only when it is properly designed for its intended use, when it is so constructed that it will retain its characteristics for a reasonable period under conditions of normal use, when it is available in denominations appropriate for a proper determination of the value or performance of the commercial equipment under test, and when it is accurately calibrated.

3.2. Tolerances for Standards. – Except for work of relatively high precision, it is recommended that the accuracy of standards used in testing commercial weighing and measuring equipment be established and maintained so that the use of corrections is not necessary. When the standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance.

Device testing is complicated to some degree when corrections to standards are applied. When using a correction for a standard, the uncertainty associated with the corrected value must be less than one-third of the applicable device tolerance. The reason for this requirement is to give the device being tested as nearly as practicable the full benefit of its own tolerance.

3.3. Accuracy of Standards. – Prior to the official use of testing apparatus, its accuracy should invariably be verified. Field standards should be calibrated as often as circumstances require. By their nature, metal volumetric field standards are more susceptible to damage in handling than are standards of some other types. A field standard should be calibrated whenever damage is known or suspected to have occurred or significant repairs have been made. In addition, field standards, particularly volumetric standards, should be calibrated with sufficient frequency to affirm their continued accuracy, so that the official may always be in an unassailable position with respect to the accuracy of his testing apparatus. Secondary field standards, such as special fabric testing tapes, should be verified much more frequently than such basic standards as steel tapes or volumetric provers to demonstrate their constancy of value or performance.

[1] See General Code, Section 1.10.; User Requirement G-UR.4.3. Use of Adjustments.

[2] Recommendations regarding the specifications and tolerances for suitable field standards may be obtained from the Office of Weights and Measures of the National Institute of Standards and Technology. Standards will meet the specifications of the National Institute of Standards and Technology Handbook 105-Series standards (or other suitable and designated standards). This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance.

Accurate and dependable results cannot be obtained with faulty or inadequate field standards. If either the service person or official is poorly equipped, their results cannot be expected to check consistently. Disagreements can be avoided and the servicing of commercial equipment can be expedited and improved if service persons and officials give equal attention to the adequacy and maintenance of their testing apparatus.

4. Inspection of Commercial Equipment

4.1. Inspection Versus Testing. – A distinction may be made between the inspection and the testing of commercial equipment that should be useful in differentiating between the two principal groups of official requirements; i.e., specifications and performance requirements. Although the term inspection is frequently loosely used to include everything that the official has to do in connection with commercial equipment, it is useful to limit the scope of that term primarily to examinations made to determine compliance with design, maintenance, and user requirements. The term testing may then be limited to those operations carried out to determine the accuracy of value or performance of the equipment under examination by comparison with the actual physical standards of the official. These two terms will be used herein in the limited senses defined.

4.2. Necessity for Inspection. – It is not enough merely to determine that the errors of equipment do not exceed the appropriate tolerances. Specification and user requirements are as important as tolerance requirements and should be enforced. Inspection is particularly important and should be carried out with unusual thoroughness whenever the official examines a type of equipment not previously encountered.

This is the way the official learns whether or not the design and construction of the device conform to the specification requirements. But even a device of a type with which the official is thoroughly familiar and that he has previously found to meet specification requirements should not be accepted entirely on faith. Some part may have become damaged, or some detail of design may have been changed by the manufacturer, or the owner or operator may have removed an essential element or made an objectionable addition. Such conditions may be learned only by inspection. Some degree of inspection is therefore an essential part of the official examination of every piece of weighing or measuring equipment.

4.3. Specification Requirements. – A thorough knowledge by the official of the specification requirements is a prerequisite to competent inspection of equipment. The inexperienced official should have his specifications before him when making an inspection and should check the requirements one by one against the equipment itself. Otherwise some important requirement may be overlooked. As experience is gained, the official will become progressively less dependent on the handbook, until finally observance of faulty conditions becomes almost automatic and the time and effort required to do the inspecting are reduced to a minimum. The printed specifications, however, should always be available for reference to refresh the official's memory or to be displayed to support his decisions, and they are an essential item of his kit.

Specification requirements for a particular class of equipment are not all to be found in the separate code for that class. The requirements of the General Code apply, in general, to all classes of equipment, and these must always be considered in combination with the requirements of the

appropriate separate code to arrive at the total of the requirements applicable to a piece of commercial equipment.

4.4. General Considerations. – The simpler the commercial device, the fewer are the specification requirements affecting it, and the more easily and quickly can adequate inspection be made. As mechanical complexity increases, however, inspection becomes increasingly important and more time consuming, because the opportunities for the existence of faulty conditions are multiplied. It is on the relatively complex device, too, that the official must be on the alert to discover any modification that may have been made by an operator that might adversely affect the proper functioning of the device.

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

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

4.5. Misuse of Equipment. – Inspection, coupled with judicious inquiry, will sometimes disclose that equipment is being improperly used, either through ignorance of the proper method of operation or because some other method is preferred by the operator. Equipment should be operated only in the manner that is obviously indicated by its construction or that is indicated by instructions on the equipment, and operation in any other manner should be prohibited.

4.6. Recommendations. – A comprehensive knowledge of each installation will enable the official to make constructive recommendations to the equipment owner regarding proper maintenance of his weighing and measuring devices and the suitability of his equipment for the purposes for which it is being used or for which it is proposed that it be used. Such recommendations are always in order and may be very helpful to an owner. The official will, of course, carefully avoid partiality toward or against equipment of specific makes and will confine his recommendations to points upon which he is qualified, by knowledge and experience, to make suggestions of practical merit.

4.7. Accurate and Correct Equipment. – Finally, the Official is reminded that commercial equipment may be accurate without being correct. A piece of equipment is accurate when its performance or value (that is, its indications, its deliveries, its recorded representations, or its capacity or actual value, etc., as determined by tests made with suitable standards) conforms to the standard within the applicable tolerances and other performance requirements. Equipment that fails so to conform is inaccurate. A piece of equipment is correct when, in addition to being accurate, it meets all applicable specification requirements. Equipment that fails to meet any of

the requirements for correct equipment is incorrect. Only equipment that is correct should be sealed and approved for commercial use.[3]

5. Correction of Commercial Equipment

5.1. Adjustable Elements. – Many types of weighing and measuring instruments are not susceptible to adjustment for accuracy by means of adjustable elements. Linear measures, liquid measures, graduates, measure containers, milk and lubricating oil bottles, farm milk tanks, dry measures, and some of the simpler types of scales are in this category. Other types (for example, taximeters and odometers and some metering devices) may be adjusted in the field, but only by changing certain parts such as gears in gear trains.

Some types, of which fabric measuring devices and cordage measuring devices are examples, are not intended to be adjusted in the field and require reconditioning in shop or factory if inaccurate. Liquid measuring devices and most scales are equipped with adjustable elements, and some vehicle tank compartments have adjustable indicators. Field adjustments may readily be made on such equipment. In the discussion that follows, the principles pointed out and the recommendations made apply to adjustments on any commercial equipment, by whatever means accomplished.

5.2. When Corrections Should Be Made – One of the primary duties of a Official is to determine whether equipment is suitable for commercial use. If a device conforms to all legal requirements, the official "marks" or "seals" it to indicate approval. If it does not conform to all official requirements, the official is required to take action to ensure that the device is corrected within a reasonable period of time. Devices with performance errors that could result in serious economic injury to either party in a transaction should be prohibited from use immediately and not allowed to be returned to service until necessary corrections have been made. The official should consider the most appropriate action, based on all available information and economic factors.

Some officials contend that it is justifiable for the official to make minor corrections and adjustments if there is no service agency nearby or if the owner or operator depends on this single device and would be "out of business" if the use of the device were prohibited until repairs could be made. Before adjustments are made at the request of the owner or the owner's representative, the official should be confident that the problem is not due to faulty installation or a defective part, and that the adjustment will correct the problem. The official should never undertake major repairs, or even minor corrections, if services of commercial agencies are readily available. The official should always be mindful of conflicts of interest before attempting to perform any services other than normal device examination and testing duties.

5.3. Gauging. – In the majority of cases, when the Official tests commercial equipment, he is verifying the accuracy of a value or the accuracy of the performance as previously established either by himself or by someone else. There are times, however, when the test of the official is the initial test on the basis of which the calibration of the device is first determined or its performance first established. The most common example of such gauging is in connection with vehicle tanks

[3] See Section 1.10. General Code and Appendix D. Definitions.

the compartments of which are used as measures. Frequently the official makes the first determination on the capacities of the compartments of a vehicle tank, and his test results are used to determine the proper settings of the compartment indicators for the exact compartment capacities desired. Adjustments of the position of an indicator under these circumstances are clearly not the kind of adjustments discussed in the preceding paragraph.

6. Rejection of Commercial Equipment

6.1. Rejection and Condemnation. – The Uniform Weights and Measures Law contains a provision stating that the director shall reject and order to be corrected such physical weights and measures or devices found to be incorrect. Weights and measures and devices that have been rejected, may be seized if not corrected within a reasonable time or if used or disposed of in a manner not specifically authorized. The director shall remove from service and may seize weights and measures found to be incorrect that are not capable of being made correct.

These broad powers should be used by the official with discretion. The director should always keep in mind the property rights of an equipment owner and cooperate in working out arrangements whereby an owner can realize at least something from equipment that has been rejected. In cases of doubt, the official should initially reject rather than condemn outright. Destruction and confiscation of equipment are harsh procedures. Power to seize and destroy is necessary for adequate control of extreme situations, but seizure and destruction should be resorted to only when clearly justified.

On the other hand, rejection is clearly inappropriate for many items of measuring equipment. This is true for most linear measures, many liquid and dry measures, graduates, measure containers, milk bottles, lubricating oil bottles, and some scales. When such equipment is "incorrect," it is either impractical or impossible to adjust or repair it, and the official has no alternative to outright condemnation. When only a few such items are involved, immediate destruction or confiscation is probably the best procedure. If a considerable number of items are involved (as, for example, a stock of measures in the hands of a dealer or a large shipment of bottles), return of these to the manufacturer for credit or replacement should ordinarily be permitted provided that the official is assured that they will not get into commercial use. In rare instances, confiscation and destruction are justified as a method of control when less harsh methods have failed.

In the case of incorrect mechanisms such as fabric measuring devices, taximeters, liquid measuring devices, and most scales, repair of the equipment is usually possible, so rejection is the customary procedure. Seizure may occasionally be justified, but in the large majority of instances this should be unnecessary. Even in the case of worn-out equipment, some salvage is usually possible, and this should be permitted under proper controls.

(Amended 1995)

7. Tagging of Equipment

7.1. Rejected and Condemned. – It will ordinarily be practicable to tag or mark as rejected each item of equipment found to be incorrect and considered susceptible of proper reconditioning. However, it can be considered justifiable not to mark as rejected incorrect devices capable of meeting acceptable performance requirements if they are to be allowed to remain in service for a

reasonable time until minor problems are corrected since marks of rejection may tend to be misleading about a device's ability to produce accurate measurements during the correction period. The tagging of equipment as condemned, or with a similar label to indicate that it is permanently out of service, is not recommended if there is any other way in which the equipment can definitely be put out of service. Equipment that cannot successfully be repaired should be dismantled, removed from the premises, or confiscated by the official rather than merely being tagged as "condemned."

(Amended 1995)

7.2. Nonsealed and Noncommercial. – Rejection is not appropriate if measuring equipment cannot be tested by the official at the time of his regular visit–for example, when there is no gasoline in the supply tank of a gasoline dispensing device. Some officials affix to such equipment a nonsealed tag stating that the device has not been tested and sealed and that it must not be used commercially until it has been officially tested and approved. This is recommended whenever considerable time will elapse before the device can be tested.

Where the official finds in the same establishment, equipment that is in commercial use and also equipment suitable for commercial use that is not presently in service, but which may be put into service at some future time, he may treat the latter equipment in any of the following ways:

(a) Test and approve the same as commercial equipment in use.

(b) Refrain from testing it and remove it from the premises to preclude its use for commercial purposes.

(c) Mark the equipment nonsealed.

Where the official finds commercial equipment and noncommercial equipment installed or used in close proximity, he may treat the noncommercial equipment in any of the following ways:

(a) Test and approve the same as commercial equipment.

(b) Physically separate the two groups of equipment so that misuse of the noncommercial equipment will be prevented.

(c) Tag it to show that it has not been officially tested and is not to be used commercially.

8. Records of Equipment

8.1. Records, General. - The official will be well advised to keep careful records of equipment that is rejected, so that he may follow up to ensure that the necessary repairs have been made. As soon as practicable following completion of repairs, the equipment should be retested. Complete records should also be kept of equipment that has been tagged as nonsealed or noncommercial. Such records may be invaluable should it subsequently become necessary to take disciplinary steps because of improper use of such equipment.

9. Sealing of Equipment

9.1. Types of Seals and Their Locations. – Most weights and measures jurisdictions require that all equipment officially approved for commercial use (with certain exceptions to be pointed out later) be suitably marked or sealed to show approval. This is done primarily for the benefit of the public to show that such equipment has been officially examined and approved. The seal of approval should be as conspicuous as circumstances permit and should be of such a character and so applied that it will be reasonably permanent. Uniformity of position of the seal on similar types of equipment is also desirable as a further aid to the public.

The official will need more than one form of seal to meet the requirements of different kinds of equipment. Good quality, weather resistant, water adhesive, or pressure sensitive seals or decalcomania seals are recommended for fabric measuring devices, liquid measuring devices, taximeters, and most scales, because of their permanence and good appearance. Steel stamps are most suitable for liquid and dry measures, for some types of linear measures, and for weights. An etched seal, applied with suitable etching ink, is excellent for steel tapes, and greatly preferable to a seal applied with a steel stamp. The only practicable seal for a graduate is one marked with a diamond or carbide pencil, or one etched with glass marking ink. For a vehicle tank, the official may wish to devise a relatively large seal, perhaps of metal, with provision for stamping data relative to compartment capacities, the whole to be welded or otherwise permanently attached to the shell of the tank. In general, the lead and wire seal is not suitable as an approval seal.

9.2. Exceptions. – Commercial equipment such as measure containers, milk bottles, and lubricating oil bottles are not tested individually because of the time element involved. Because manufacturing processes for these items are closely controlled, an essentially uniform product is produced by each manufacturer. The official normally tests samples of these items prior to their sale within his jurisdiction and subsequently makes spot checks by testing samples selected at random from new stocks.

Another exception to the general rule for sealing approved equipment is found in certain very small weights whose size precludes satisfactory stamping with a steel die.

10. Rounding Off Numerical Values

10.1. Definition. – To round off or round a numerical value is to change the value of recorded digits to some other value considered more desirable for the purpose at hand by dropping or changing certain figures. For example, if a computed, observed, or accumulated value is 4738, this can be rounded off to the nearest thousand, hundred, or ten, as desired. Such rounded off values would be, respectively, 5000, 4700, and 4740. Similarly, a value such as 47.382 can be rounded off to two decimal places, to one decimal place, or to the units place. The rounded off figures in this example would be, respectively, 47.38, 47.4, and 47.

10.2. General Rules. – The general rules for rounding off may be stated briefly as follows:

(a) When the figure next beyond the last figure or place to be retained is less than 5, the figure in the last place retained is to be kept unchanged. When rounding off 4738 to the nearest hundred, it is noted that the figure 3 (next beyond the last figure to be retained) is less than 5. Thus, the rounded off value would be 4700. Likewise, 47.382 rounded to two decimal places becomes 47.38.

(b) When the figure next beyond the last figure or place to be retained is greater than 5, the figure in the last place retained is to be increased by 1. When rounding off 4738 to the nearest thousand, it is noted that the figure 7 (next beyond the last figure to be retained) is greater than 5. Thus, the rounded off value would be 5000. Likewise, 47.382 rounded to one decimal place becomes 47.4.

(c) When the figure next beyond the last figure to be retained is 5 followed by any figures other than zero(s), treat as in (b) above; that is, the figure in the last place retained is to be increased by 1. When rounding off 4501 to the nearest thousand, 1 is added to the thousands figure and the result becomes 5000.

(d) When the figure next beyond the last figure to be retained is 5 and there are no figures, or only zeros, beyond this 5, the figure in the last place to be retained is to be left unchanged if it is even (0, 2, 4, 6, or 8) and is to be increased by 1 if it is odd (1, 3, 5, 7, or 9). This is the odd and even rule, and may be stated as follows: "If odd, then add." Thus, rounding off to the first decimal place, 47.25 would become 47.2 and 47.15 would become 47.2. Also, rounded to the nearest thousand, 4500 would become 4000 and 1500 would become 2000.

It is important to remember that, when there are two or more figures to the right of the place where the last significant figure of the final result is to be, the entire series of such figures must be rounded off in one step and not in two or more successive rounding steps. [Expressed differently, when two or more such figures are involved, these are not to be rounded off individually, but are to be rounded off as a group.] Thus, when rounding off 47.3499 to the first decimal place, the result becomes 47.3. In arriving at this result, the figures "499" are treated as a group. Since the 4 next beyond the last figure to be retained is less than 5, the "499" is dropped (see subparagraph (a) above). It would be incorrect to round off these figures successively to the left so that 47.3499 would become 47.350 and then 47.35 and then 47.4.

10.3. Rules for Reading of Indications. – An important aspect of rounding off values is the application of these rules to the reading of indications of an indicator and graduated scale combination (where the majority of the indications may be expected to lie somewhere between two graduations) if it is desired to read or record values only to the nearest graduation. Consider a vertical graduated scale and an indicator. Obviously, if the indicator is between two graduations but is closer to one graduation than it is to the other adjacent graduation, the value of the closer graduation is the one to be read or recorded.

In the case where, as nearly as can be determined, the indicator is midway between two graduations, the odd and even rule is invoked, and the value to be read or recorded is that of the graduation whose value is even. For example, if the indicator lies exactly midway between two graduations having values of 471 and 472, respectively, the indication should be read or recorded as 472, this being an even value. If midway between graduations having values of 474 and 475, the even value 474 should be read or recorded. Similarly, if the two graduations involved had values of 470 and 475, the even value of 470 should be read or recorded.

A special case not covered by the foregoing paragraph is that of a graduated scale in which successive graduations are numbered by twos, all graduations thus having even values; for

example, 470, 472, 474, etc. When, in this case, an indication lies midway between two graduations, the recommended procedure is to depart from the practice of reading or recording only to the value of the nearest graduation and to read or record the intermediate odd value. For example, an indication midway between 470 and 472 should be read as 471.

10.4. Rules for Common Fractions. – When applying the rounding off rules to common fractions, the principles are to be applied to the numerators of the fractions that have, if necessary, been reduced to a common denominator. The principle of "5s" is changed to the one half principle; that is, add if more than one half, drop if less than one half, and apply the odd and even rule if exactly one half.

For example, a series of values might be $1^{1}/32$, $1^{2}/32$, $1^{3}/32$, $1^{4}/32$, $1^{5}/32$, $1^{6}/32$, $1^{7}/32$, $1^{8}/32$, $1^{9}/32$. Assume that these values are to be rounded off to the nearest eighth ($^{4}/32$). Then,

$1^{1}/32$ becomes 1. ($^{1}/32$ is less than half of $^{4}/32$ and accordingly is dropped.)

$1^{2}/32$ becomes 1. ($^{2}/32$ is exactly one-half- of $^{4}/32$; it is dropped because it is rounded (down) to the "even" eighth, which in this instance is $^{0}/8$.)

$1^{3}/32$ becomes $1^{4}/32$ or $1^{1}/8$. ($^{3}/32$ is more than half of $^{4}/32$, and accordingly is rounded "up" to $^{4}/32$ or $^{1}/8$).

$1^{4}/32$ remains unchanged, being an exact eighth ($1^{1}/8$).

$1^{5}/32$ becomes $1^{4}/32$ or $1^{1}/8$. ($^{5}/32$ is $^{1}/32$ more than an exact $^{1}/8$; $^{1}/32$ is less than half of $^{4}/32$ and accordingly is dropped.)

$1^{6}/32$ becomes $1^{2}/8$ or 1¼. ($^{6}/32$ is $^{2}/32$ more than an exact $^{1}/8$; $^{2}/32$ is exactly one-half of $^{4}/32$, and the final fraction is rounded (up) to the "even" eighth, which in this instance is $^{2}/8$.)

$1^{7}/32$ becomes $1^{2}/8$ or 1¼. ($^{7}/32$ is $^{3}/32$ more than an exact $^{1}/8$; $^{3}/32$ is more than one-half of $^{4}/32$ and accordingly the final fraction is rounded (up) to $^{2}/8$ or ¼.)

$1^{8}/32$ remains unchanged, being an exact eighth ($1^{2}/8$ or 1¼.)

$1^{9}/32$ becomes $1^{2}/8$ or 1¼. ($^{9}/32$ is $^{1}/32$ more than an exact $^{1}/8$; $^{1}/32$ is less than half of $^{4}/32$ and accordingly is dropped.)

Note: The bolded blue text in brackets [ ] appearing within the NIST Handbook 44 (HB-44) code is not part of HB-44 but additional information to assist the user in understanding and applying the applicable requirements of HB-44.

[KEY ELEMENTS OF HB-44 GENERAL CODE

- **Applies to all devices except when superseded by a specific code requirement**
- **Applicability of HB-44, applicable to commercial and law enforcement devices**
- **General Marking and Sealing requirements**
- **Defines Retroactive and Non-Retroactive tolerances**
- **Defines Acceptance and Maintenance tolerances.**
- **General User Requirements**

The General Code is not a stand-alone code. It is to be used in conjunction with the specific device codes just as they are to be used with the General Code. The specific code always takes precedence over the General Code when there is a conflict.]

G-A. Application

G-A.1. Commercial and Law-Enforcement Equipment. - These Specifications, tolerances, and other technical requirements apply as follows:

The specifications, tolerances, and other technical requirements of HB-44 apply to:

(a) commercial weighing and measuring equipment; that is, to weights and measures and weighing and measuring devices commercially used or employed in establishing the size, quantity, extent, area, composition (limited to meat and poultry), constituent values (limited to grain), or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award, or in computing any basic charge or payment for services rendered on the basis of weight or measure.

[Simply stated, HB-44 is applicable to devices use to buy, sell, or determine any charges based on weight or measure.]

(b) To any accessory attached to or used in connection with a commercial weighing or measuring device when such accessory is so designed that its operation affects the accuracy of the device.

[The authority of weights and measures jurisdiction is limited to only devices that weigh or measure. However, when another device (associated and ancillary equipment) is connected to it, that device then falls under the jurisdiction of the Weights and Measures Agency. An example of this is a point-of-sale system connected to a retail computing scale.

The purpose of an inspection and test is not only to ensure that the device is accurate, but also that transaction is correct and the opportunity for fraud is eliminated to the highest degree possible. This requires inspecting and testing all components of the system and verifying if the device is being used properly.]

(c) To weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.

G-A.2. Code Application. – This General Code shall apply to all classes of devices as covered in the specific codes. The specific code requirements supersede General Code requirements in all cases of conflict.

[The General Code applies to all devices, but the Specific Code section is to be applied when there is a difference or conflict.]

G-A.3. Special and Unclassified Equipment. – Insofar as they are clearly appropriate, the requirements and provisions of the General Code and of specific codes apply to equipment failing, by reason of special design or otherwise, to fall clearly within one of the particular equipment classes for which separate codes have been established. With respect to such equipment, code requirements and provisions shall be applied with due regard to the design, intended purpose, and conditions of use of the equipment.

[HB-44 does not have Specific Codes for all devices. Devices not specified in HB-44 may be commercial and subject to the inspection and test. The General Code and to the degree applicable, the relevant Specific Code(s) may be applied.]

G-A.4. Metric Equipment. – Employment of the weights and measures of the metric system is lawful throughout the United States. These specifications, tolerances, and other requirements shall not be understood or construed as in any way prohibiting the manufacture, sale, or use of equipment designed to give results in terms of metric units. The specific provisions of these requirements and the principles upon which the requirements are based shall be applied to metric equipment insofar as appropriate and practicable. The tolerances on metric equipment, when not specified herein, shall be equivalent to those specified for similar equipment constructed or graduated in the U.S. customary system.

[The use of metric equipment is permissible in the United States. HB-44 contains the necessary information to inspect metric devices.]

G-A.5. Retroactive Requirements. – "Retroactive" requirements are enforceable with respect to all equipment. Retroactive requirements are printed herein in upright roman type.

[It is important to note the date of installation into commercial service within the state of use to avoid improperly applying a nonretroactive requirement.]

G-A.6. Nonretroactive Requirements. – "Nonretroactive" requirements are enforceable on or after the effective date for devices:

(a) manufactured within a state after the effective date;
(b) both new and used, brought into a state after the effective date;
(c) used in noncommercial applications which are placed into commercial use after the effective date; and
(d) undergoing type evaluation, including devices that have been modified to the extent that a new NTEP Certificate of Conformance (CC) is required.

Nonretroactive requirements are not enforceable with respect to devices that are in commercial service in the state as of the effective date or to new equipment in the stock of a manufacturer or a dealer in the state as of the effective date.

[Nonretroactive requirements are printed in italic type.]

[The nonretroactive requirement is not applied if the device was manufactured in the state before the requirement was added to HB-44.

The nonretroactive requirement is not applied to a device if it was manufactured and placed into commercial service before the nonretroactive date *UNLESS* it is brought into a different state and placed into commercial service after the nonretroactive date. In this case, the device must meet all HB-44 requirements as if it were a new device.

The requirements of HB-44 do not apply to noncommercial devices, except when noncommercial devices are later placed into commercial service.

In this instance, all requirements of HB-44 including nonretroactive requirements, regardless of date of manufacture for the device are applicable. For all intents and purposes, it is a "new" device.

Nonretroactive requirements are enforceable for devices undergoing type evaluation, including devices that have been modified to the extent that a new NTEP Certificate of Conformance (CC) is required unless:

The devices are in commercial service in the state as of the effective date or to new equipment in the stock of a manufacturer or a dealer in the state as of the effective date.]

G-A.7. Effective Enforcement Dates of Code Requirements. – Unless otherwise specified, each new or amended code requirement shall not be subject to enforcement prior to January 1 of the year following the adoption by the National Conference on Weights and Measures and publication by the National Institute of Standards and Technology.

[Key elements:

- **New or amended requirements are usually adopted by the NCWM in July but they are not enforceable until January 1 of the following year. Example: Adopted July 20, 2021, but not enforceable until January 1, 2022.**

- **There have been times when the NCWM, because of the significant impact of the requirement has made it effective immediately upon adoption.**

- **It is important to note that HB-44 does not carry the force of law until it is adopted into law by a government agency. Thus, it is imperative to understand which edition of HB-44 your state has adopted as this will impact what requirements are legally enforceable.**

- **HB-44 defines "built-for-purpose device as – Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system."**

- **Not-Built-For-Purpose refers to software than can be used in a variety of applications.]**

G-S. Specifications

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;
(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lower case.

[Nonretroactive as of January 1, 2003]

(c) a nonrepetitive serial number, except for equipment with no moving or electronic component parts and software;

[Nonretroactive as of January 1, 1968]

The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).

[Nonretroactive as of January 1, 2001]

(d) the current software version or revision identifier for not-built-for-purpose, software-based devices manufactured as of January 1, 2004, and all software-based devices (or equipment) manufactured as of January 1, 2022;

The version or revision identifier shall be:

i. prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.

[Nonretroactive as of January 1, 2007]

NOTE: If the equipment is capable of displaying the version or revision identifier, but is unable to meet the formatting requirements, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.

ii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.

[Nonretroactive as of January 1, 2022]

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

[Nonretroactive as of January 1, 2007]
(Added 2006)

(e) a National Type Evaluation Program (NTEP) Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC.

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).

[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

[A device, subject to the nonretroactive dates must be permanently marked with:

- **the name, initials, or trademark of the manufacturer or distributor,**
- **the model,**
- **nonrepetitive serial number,**
- **the current software version or revision identifier for not-built-for-purpose, software-based devices manufactured as of January 1, 2004, and all software-based devices (or equipment) manufactured as of January 1, 2022,**
- **NTEP CC number]**

G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices. – For not-built-for-purpose, software-based devices either:

(a) The required information in G-S.1 Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

(b) The Certificate of Conformance (CC) Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) 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 (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.
[Nonretroactive as of January 1, 2004]

[There are three options for not-built-for-purpose, software devices to comply with the marking information requirement.

- **The information can be permanently marked on the device**
- **Continuously displayed**
- **Be accessible from an easily recognized menu. Refer to the NTEP CC for clear instructions for accessing the information not continuously displayed.]**

G-S.1.2. Devices and Main Elements Remanufactured as of January 1, 2002. – All devices and main elements remanufactured as of January 1, 2002, shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the last remanufacturer or distributor; and
(b) the remanufacturer's or distributor's model designation, if different than the original model designation.

NOTE: Definitions for "manufactured device," "repaired device," and "repaired element" are included (along with definitions for "remanufactured device" and "remanufactured element") in Appendix D, Definitions.

[A remanufactured device must be marked with the name, initials, or trademark of the last remanufacturer or distributor, and the remanufacturer's or distributor's model designation, if different than the original model designation.

A remanufactured device is device that is disassembled, checked for wear, parts replaced or fixed, reassembled and made to operate like a new device of the same type.]

G-S.2. Facilitation of Fraud. – All equipment and all mechanisms, software, and devices attached to or used in conjunction therewith shall be so designed, constructed, assembled, and installed for use such that they do not facilitate the perpetration of fraud.

[It is a duty of Officials to ensure that the device is correct (conforms with applicable specifications and tolerances) and the transaction is accurate.

The entire weighing or measuring system must be inspected with an eye toward detecting fraud or design flaws that may intentionally or unintentionally introduce errors into the measurement that will result in the buyer or seller receiving less than the quantity for which they have paid or should be paid.

Not maintaining the retail computing scale in a zero-load balance or failing to take tare or take the proper tare will result in an inaccurate transaction even if the retail computing scale is accurate.]

G-S.3. Permanence. – All equipment shall be of such materials, design, and construction as to make it probable that, under normal service conditions:
(a) accuracy will be maintained;
(b) operating parts will continue to function as intended; and
(c) adjustments will remain reasonably permanent.

Undue stresses, deflections, or distortions of parts shall not occur to the extent that accuracy or permanence is detrimentally affected.

G-S.4. Interchange or Reversal of Parts. – Parts of a device that may readily be interchanged or reversed in the course of field assembly or of normal usage shall be:

(a) so constructed that their interchange or reversal will not affect the performance of the device; or

(b) so marked as to show their proper positions.

G-S.5. Indicating and Recording Elements.

G-S.5.1. General. – All weighing and measuring devices shall be provided with indicating or recording elements appropriate in design and adequate in amount. Primary indications and recorded representations shall be clear, definite, accurate, and easily read under any conditions of normal operation of the device.

[Retail computing scales must be equipped with a weight display that the customer can see from a reasonable customer position (see S.1.8.4. Customer's Indications).]

G-S.5.2. Graduations, Indications, and Recorded Representations.

G-S.5.2.1. Analog Indication and Representation. – Graduations and a suitable indicator shall be provided in connection with indications designed to advance continuously.

[An analog device, for example, a drum scale, must have graduations and a pointer or some other physical means to indicate the weight.]

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

(a) All digital values of like value in a system agree with one another.
(b) A digital value coincides with its associated analog value to the nearest minimum graduation.
(c) A digital value "rounds off" to the nearest minimum unit that can be indicated or recorded.
(d) A digital zero indication includes the display of a zero for all places that are displayed to the right of the decimal point and at least one place to the left. When no decimal values are displayed, a zero shall be displayed for each place of the displayed scale division.

[Nonretroactive as of January 1, 1986]

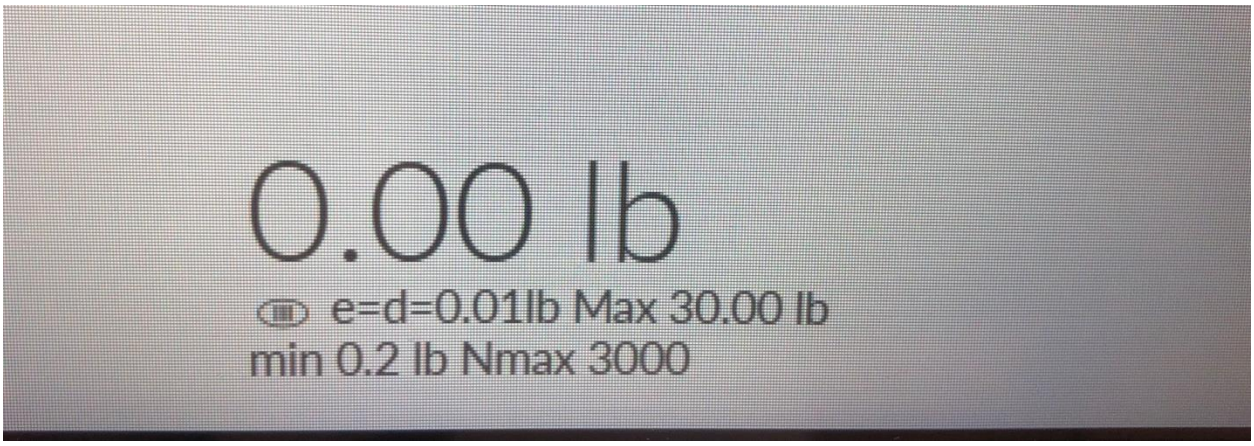
[The digital value of a digital display must agree with its printed value.

The analog display must agree with its associated analog value to the nearest minimum value.

Digital values round off to the nearest minimum unit that can be indicated or recorded, i.e., when between whole values, to the nearest whole value above or below.

A device that has a digital display must indicate the appropriate number of places for its scale divisions. A retail computing scale with 0.01-lb scale divisions must display one zero to the left of decimal point and two to the right (0.00 LB).]

Example of correct display. The Point-of-Sale display includes marking requirement information in addition to the weight display. Note: It clearly indicates that e = d and d = 0.01lb and that the minimum load from Table 8 is 0.2lb (20 d).



G-S.5.2.3. Size and Character. – In any series of graduations, indications, or recorded representations, corresponding graduations and units shall be uniform in size and character. Graduations, indications, or recorded representations that are subordinate to, or of a lesser value than others with which they are associated, shall be appropriately portrayed or designated.

[Made retroactive as of January 1, 1975]

[All graduations must be uniform in size and character and subordinate or lesser values must be differentiated, generally, by being smaller.]

G-S.5.2.4. Values. – If graduations, indications, or recorded representations are intended to have specific values, these shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof, uniformly placed with reference to the graduations, indications, or recorded representations and as close thereto as practicable, but not so positioned as to interfere with the accuracy of reading.

G-S.5.2.5. Permanence. – Graduations, indications, or recorded representations and their defining figures, words, and symbols shall be of such character that they will not tend easily to become obliterated or illegible.

G-S.5.3. Values of Graduated Intervals or Increments. – In any series of graduations, indications, or recorded representations, the values of the graduated intervals or increments shall be uniform throughout the series.

[All graduations, indications and recorded representations must be uniform.]

G-S.5.3.1. On Devices That Indicate or Record in More Than One Unit. – On devices designed to indicate or record in more than one unit of measurement, the values indicated and recorded shall be identified with an appropriate word, symbol, or abbreviation.

[The values of devices can indicate and record in more than one value, e.g., pounds and kilograms must be clearly identified.]

G-S.5.4. Repeatability of Indications. – A device shall be capable of repeating, within prescribed tolerances, its indications and recorded representations. This requirement shall be met irrespective of repeated manipulation of any element of the device in a manner approximating normal usage (including displacement of the indicating elements to the full extent allowed by the construction of the device and repeated operation of a locking or relieving mechanism) and of the repeated performance of steps or operations that are embraced in the testing procedure.

[Devices must be capable of repeating their indications within the prescribed tolerances. Any scale must be able to repeat the display of a weight repeatedly.]

G-S.5.5. Money Values, Mathematical Agreement. – Any recorded money value and any digital money value indication on a computing-type weighing or measuring device used in retail trade shall be in mathematical agreement with its associated quantity representation or indication to the nearest 1 cent of money value. This does not apply to auxiliary digital indications intended for the operator's use only, when these indications are obtained from existing analog customer indications that meet this requirement.

G-S.5.6. Recorded Representations. – Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations. All recorded values shall be printed digitally.

In applications where recorded representations are required, the customer may be given the option of not receiving the recorded representation. For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.

[Indicated and recorded representations are to be digital. A receipt may be emailed or texted to the customer.]

G-S.5.6.1. Indicated and Recorded Representation of Units. – Appropriate abbreviations.

(a) For equipment manufactured on or after January 1, 2008, the appropriate defining symbols are shown in NIST Special Publication SP 811 "Guide for the Use of International System of Units (SI)" and Handbook 44 Appendix C – General Tables of Units of Measurement.

Table 1. Representation of SI Units on Equipment Manufactured Prior to January 1, 2008, with Limited Character Sets				
Name of Unit	International Symbol (common use symbol)	Representation		
		Form I	Form II	
		(double case)	(single case lower)	(single case upper)
Base SI Units				
Meter Kilogram	M Kg	M Kg	M Kg	M KG
Derived SI Units				
Newton Pascal Watt Volt degree Celsius	N Pa W V °C	N Pa W V °C	n pa w v °c	N PA W V °C
Other Units				
Liter Gram metric ton Bar	l or L G T Bar	L G T Bar	l g tne bar	L G TNE BAR

Note: SP 811 can be viewed or downloaded at **http://physics.nist.gov/cuu/pdf/sp811.pdf** or by going to **http://www.nist.gov/pml/wmd/index.cfm** and selecting Weights and Measures Publications and the link to Special Publications (SP 811), "**Guide for the Use of the International System of Units** (SI)."

(b) The appropriate defining symbols on equipment manufactured prior to January 1, 2008, with limited character sets are shown in Table 1. Representation of SI Units on Equipment Manufactured Prior to January 1, 2008, with Limited Character Sets.

(Added 1977) (Amended 2007)

(Table Amended 2007)

G-S.5.7. Magnified Graduations and Indications. – All requirements for graduations and indications apply to a series of graduations and an indicator magnified by an optical system or as magnified and projected on a screen.

G-S.6. Marking Operational Controls, Indications, and Features. – All operational controls, indications, and features, including switches, lights, displays, push buttons, and other means, shall be clearly and definitely identified. The use of approved pictograms or symbols shall be acceptable.

[Nonretroactive as of January 1, 1977]

[All controls or features of a device must be clearly and definitively identified. Approved pictograms and symbols are acceptable.]

G-S.7. Lettering. – All required markings and instructions shall be distinct and easily readable and shall be of such character that they will not tend to become obliterated or illegible.

[All markings and instructions must be legible and easily readable.]

G-S.8. Provision for Sealing Electronic Adjustable Components. *– A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.*
[Nonretroactive as of January 1, 1990]

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

Amended 1989 and 1993)

[All electronic adjustable components that can affect the *metrological integrity* (accuracy and/or performance) of the device must be sealable. This can be done with a physical seal or electronic data change audit trail.

A device with an automatic or semi-automatic calibration mechanism is acceptable provided it is incorporated inside of the device and is sealable.

Means to seal include:

- **A physical seal that must be broken to access configuration or calibration features**
- **An event logger that tracks and counts the number of configuration and calibration changes; or an event logger that logs specific information about configuration and calibration changes.**
- **Refer to the specific code and the NTEP CC for additional information regarding sealing requirements; specifically, the "Sealing" section of the NTEP CC.**

NTEP CC DATABASE SEARCH https://www.ncwm.com/ntep-certificates]

G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. – A change to any metrological parameter (calibration or configuration) of any weighing or measuring element shall be individually identified.

[Nonretroactive as of January 1, 2010]

Note: For devices that utilize an electronic form of sealing, in addition to the requirements in G-S.8.1., any appropriate audit trail requirements in an applicable specific device code also apply.

Examples of identification of a change to the metrological parameters of a weighing or measuring element include, but are not limited to:

a broken, missing, or replaced physical seal on an individual weighing, measuring, or indicating element or active junction box;
a change in a calibration factor or configuration setting for each weighing or measuring element;

a display of the date of calibration or configuration event for each weighing or measuring element; or

counters indicating the number of calibration and/or configuration events for each weighing or measuring element.

[Multiple Weighing or Measuring Elements that share a common provision for sealing must be separately identified when using an electronic means of sealing, e.g., "scale 1 and scale 2"]

G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device*, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using either:

an event logger in the device; or

a physical seal that must be broken in order to remove the digital storage device from the device (or system). If security is provided using an event logger, the event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

* Applies only to removable digital storage devices that must remain in the device or system for it to be operational.

[Devices that have a removable data storage device for configuration and/or calibration changes, must be sealed with either an electronic seal or a physical seal to prevent removing the data storage device after calibration, if it intended to remain in the device.]

G-S.9. Metrologically Significant Software Updates. – A software update that changes the metrologically significant software shall be considered a sealable event.

[Metrologically Significant Software updates (updates that affect the performance, not appearance on other non-performance features) must be sealable and identified in an event logger or audit trail.]

G-N. Notes

G-N.1. Conflict of Laws and Regulations. – If any particular provisions of these specifications, tolerances, and other requirements are found to conflict with existing state laws, or with existing regulations or local ordinances relating to health, safety, or fire prevention, the enforcement of such provisions shall be suspended until conflicting requirements can be harmonized. Such suspension shall not affect the validity or enforcement of the remaining provisions of these specifications, tolerances, and other requirements.

[The conflict, when one exists between the requirements contained in HB-44 and other government laws and regulations, must be resolved before proceeding.]

G-N.2. Testing with Nonassociated Equipment. – Tests to determine conditions, such as radio frequency interference (RFI) that may adversely affect the performance of a device shall be conducted with equipment and under conditions that are usual and customary with respect to the location and use of the device.

[Nonassociated equipment, e.g., a handheld radio, may be used to test RFI if the equipment and test replicate normal and usual use at the location. This is easily addressed by having the operator use their equipment and observe the performance of the scale.

Nonassociated equipment is not just limited to handheld radios. Be aware of other electronic equipment that might affect performance of the device and if the equipment is not in operation, it may be appropriate to ask management to turn on the equipment.]

G-T. Tolerances

G-T.1. Acceptance Tolerances. – Acceptance tolerances shall apply to equipment:

(a) to be put into commercial use for the first time;
(b) that has been placed in commercial service within the preceding 30 days and is being officially tested for the first time;
(c) that has been returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time within 30 days after corrective service;
(d) that is being officially tested for the first time within 30 days after major reconditioning or overhaul; and
(e) undergoing type evaluation.

[Devices undergoing type evaluation refers to when an NTEP evaluator is conducting an NTEP evaluation. They will apply acceptance tolerance throughout the entire evaluation regardless of (a) through (d).]

G-T.2. Maintenance Tolerances. – Maintenance tolerances shall apply to equipment in actual use, except as provided in G-T.1. Acceptance Tolerances.

[Maintenance tolerances are applied when not applying acceptance tolerances.]

G-T.3. Application. – Tolerances "in excess" and tolerances "in deficiency" shall apply to errors in excess and to errors in deficiency, respectively. Tolerances "on overregistration" and tolerances "on underregistration" shall apply to errors in the direction of overregistration and of underregistration, respectively. (Also see Appendix D, Definitions.)

[Tolerances apply regardless of the direction of error; overregistraion or underregistraion. Acceptance tolerance is generally half of Maintenance Tolerance.]

G-T.4. For Intermediate Values. – For a capacity, indication, load, value, etc., intermediate between two capacities, indications, loads, values, etc., listed in a table of tolerances, the tolerances prescribed for the lower capacity, indication, load, value, etc., shall be applied.

[When the value is between two tolerance points, always apply the tolerance for the lower value.]

G-UR. User Requirements

[User Requirements are the responsibility of the device owner or operator and enforced by the Official. Remember, an improperly used device, no matter how accurate it is, will not yield accurate results.]

G-UR.1. Selection Requirements.

G-UR.1.1. Suitability of Equipment. – Commercial equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to its weighing capacity (for weighing devices), its computing capability (for computing devices), its rate of flow (for liquid-measuring devices), the character, number, size, and location of its indicating or recording elements, and the value of its smallest unit and unit prices.

[The initial step in an inspection is determining suitability of a device for the specific application. The NTEP CC's application section should be reviewed to understand the device's approved uses.]

G-UR.1.2. Environment. – Equipment shall be suitable for the environment in which it is used including, but not limited to, the effects of wind, weather, and RFI.

[The device must be suitable for the environment in which it is used, including temperature.

Fans and air conditioning, like wind, may adversely impact the performance of the scale, e.g., maintaining a zero-load balance condition.]

G-UR.2. Installation Requirements.

G-UR.2.1. Installation. – A device shall be installed in accordance with the manufacturer's instructions, including any instructions marked on the device. A device installed in a fixed location shall be installed so that neither its operation nor its performance will be adversely affected by any characteristic of the foundation, supports, or any other detail of the installation.

G-UR.2.1.1. Visibility of Identification. – Equipment shall be installed in such a manner that all required markings are readily observable.

G-UR.2.2. Installation of Indicating or Recording Element. – A device shall be so installed that there is no obstruction between a primary indicating or recording element and the weighing or measuring element; otherwise there shall be convenient and permanently installed means for direct communication, oral or visual, between an individual located at a primary indicating or recording element and an individual located at the weighing or measuring element. (Also see G-UR.3.3. Position of Equipment.)

G-UR.2.3. Accessibility for Inspection, Testing, and Sealing Purposes. – A device shall be located, or such facilities for normal access thereto shall be provided, to permit:

(a) inspecting and testing the device;
(b) inspecting and applying security seals to the device; and
(c) readily bringing the testing equipment of the Official to the device by customary means and in the amount and size deemed necessary by such official for the proper conduct of the test.

Otherwise, it shall be the responsibility of the device owner or operator to supply such special facilities, including such labor as may be needed to inspect, test, and seal the device, and to transport the testing equipment to and from the device, as required by the Official.

[The device must be installed and located to allow inspection and testing, applying security seals, ease of bringing test equipment without unnecessary, abnormal, or unsafe means to accomplish it.

It is the responsibility of the device owner or operator to supply the means and labor to inspect, test and seal the device.]

G-UR.3. Use Requirements.

G-UR.3.1. Method of Operation. – Equipment shall be operated only in the manner that is obviously indicated by its construction or that is indicated by instructions on the equipment.

[Abnormal or unintended use of equipment is unacceptable. It is important to observe employees using the device to ensure it is being used properly.]

G-UR.3.2. Associated and Nonassociated Equipment. – A device shall meet all performance requirements when associated or nonassociated equipment is operated in its usual and customary manner and location.

G-UR.3.3. Position of Equipment. – A device or system equipped with a primary indicating element and used in direct sales, except for prescription scales, shall be positioned so that its indications may be accurately read and the weighing or measuring operation may be observed from some reasonable "customer" and "operator" position. The permissible distance between the equipment and a reasonable customer and operator position shall be determined in each case upon the basis of the individual circumstances, particularly the size and character of the indicating element.

[Compliance with the requirement, due to many variables, is determined on a case-by-case basis. The key point is that the customer must be able to see all aspects of the weighing process to protect against fraud.]

G-UR.3.4. Responsibility, Money-Operated Devices. – Money-operated devices, other than parking meters, shall have clearly and conspicuously displayed thereon, or immediately adjacent thereto, adequate information detailing the method for the return of monies paid when the product or service cannot be obtained. This information shall include the name, address, and phone number of the local responsible party for the device. This requirement does not apply to devices at locations where employees are present and responsible for resolving any monetary discrepancies for the customer.

[The information may be required even when employees are present in the store if the device is owned by a third-party and the employees do not have the authority to resolve disputes.]

G-UR.4. Maintenance Requirements.

G-UR.4.1. Maintenance of Equipment. – All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service at a single place of business shall not be considered "maintained in a proper operating condition" if: predominantly, equipment of all types or applications are found to be in error in a direction favorable to the device user; or predominantly, equipment of the same type or application is found to be in error in a direction favorable to the device user.

[Both inspecting and testing a device, as well as inquiring about routine maintenance is necessary to ensure adherence to this requirement.

Devices must be maintained in proper operating condition and adjusted as close to zero as possible. There must not be a bias in a direction that is favorable to the device owner.]

G-UR.4.2. Abnormal Performance. – Unstable indications or other abnormal equipment performance observed during operation shall be corrected and, if necessary, brought to the attention of competent service personnel.

G-UR.4.3. Use of Adjustments. – Weighing elements and measuring elements that are adjustable shall be adjusted only to correct those conditions that such elements are designed to control and shall not be adjusted to compensate for defective or abnormal installation or accessories or for badly worn or otherwise defective parts of the assembly. Any faulty installation conditions shall be corrected, and any defective parts shall be renewed or suitably repaired, before adjustments are undertaken. Whenever equipment is adjusted, the adjustments shall be so made as to bring performance errors as close as practicable to zero value.

[The device must be maintained in properly operating condition and any abnormal performance can only be corrected using the features intended to correct, adjust and calibrate the device. For example, tare cannot be used in place of a non-functioning zero-setting mechanism.

Only original equipment manufacturer parts or NTEP equivalent parts may be used when the device is traceable to an NTEP CC. Failure to comply may invalidate the NTEP CC. NTEP CC DATABASE SEARCH https://www.ncwm.com/ntep-certificates]

G-UR.4.4. Assistance in Testing Operations. – If the design, construction, or location of any device is such as to require a testing procedure involving special equipment or accessories or an abnormal amount of labor, such equipment, accessories, and labor shall be supplied by the owner or operator of the device as required by the Official.

G-UR.4.5. Security Seal. – A security seal shall be appropriately affixed to any adjustment mechanism designed to be sealed.

G-UR.4.6. Testing Devices at a Central Location.

(a) When devices in commercial service require special test facilities, or must be removed from service for testing, or are routinely transported for the purpose of use (e.g., vehicle-mounted devices and devices used in multiple locations), the official with statutory authority may require that the devices be brought to a central location for testing. The dealer or owner of these devices shall provide transportation of the devices to and from the test location.

(b) When the request for removal and delivery to a central test location involves devices used in submetering (e.g., electric, hydrocarbon vapor, or water meters), the owner or operator shall not interrupt the utility service to the customer or tenant except for the removal and replacement of the

device. Provisions shall be made by the owner or operator to minimize inconvenience to the customer or tenant. All replacement or temporary meters shall be tested and sealed by a Official or bear a current, valid approval seal prior to use.

[For example, it is common that scales intended to be used at a Farmer's Market are tested prior to the beginning of the Farmer's Market season at a central location. This is beneficial to the Weights and Measures Official as it is efficient and to the vendors since the inspection will not disrupt operations during the Farmer's Market. However, a visit to the Farmer's Market during its operation to observe the operation of the scales is advisable.]

MODIFIED HB-44 CLASS III RETAIL COMPUTING SCALES CODE

****Requirements not applicable to Retail Computing Scales are not included****

S. Specifications

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

S.1.1. Zero Indication.

(a) On a scale equipped with indicating or recording elements, provision shall be made to either indicate or record a zero-balance condition.

(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.

(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.

(Added 1987) (Amended 1993)

(Amended 1987)

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division.

(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ of a scale division or less. A "center-of-zero" indication may operate when zero is indicated for gross and/or net mode(s).
[Nonretroactive as of January 1, 1993]

(c) For electronic cash registers (ECRs) and point-of-sale systems (POS systems) the display of measurement units shall be a minimum of 9.5 mm (3/8 inch) in height.
[Nonretroactive as of January 1, 2021]

(Added 2019)

(Amended 1992, 2008, and 2019)

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

(a) 1, 2, or 5; or

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

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

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

Examples: scale divisions may be ½, ¼, ⅛, 1/16, etc.

[Nonretroactive as of January 1, 1986]

S.1.2.1. Digital Indicating Scales, 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.*

(Added 1987) (Amended 2008)

S.1.2.2.4. Class III and IIII Scales. The value of "e" is specified by the manufacturer as marked on the device. Except for dynamic monorail scales, "e" must be less than or equal to "d." (Added 1999)

["e" is the abbreviation for "verification scale division". Generally, "e" will equal "d" but in no case can it be greater than "d".]

S.1.3. Graduations.

S.1.3.1. Length. – Graduations shall be so varied in length that they may be conveniently read.

S.1.3.2. Width. – In any series of graduations, the width of a graduation shall in no case be greater than the width of the clear space between graduations. The width of main graduations shall be not more than 50 % greater than the width of subordinate graduations. Graduations shall be not less than 0.2 mm (0.008 in) wide.

S.1.3.3. Clear Space Between Graduations. – The clear space between graduations shall be not less than 0.5 mm (0.02 in) for graduations representing money-values, and not less than 0.75 mm (0.03 in) for other graduations. If the graduations are not parallel, the measurement shall be made:

(a) along the line of relative movement between the graduations at the end of the indicator; or

(b) if the indicator is continuous, at the point of widest separation of the graduations.

S.1.4. Indicators.

S.1.4.1. Symmetry. – The index of an indicator shall be of the same shape as the graduations, at least throughout that portion of its length associated with the graduations.

S.1.4.2. Length. – The index of an indicator shall reach to the finest graduations with which it is used, unless the indicator and the graduations are in the same plane, in which case, the distance between the end of the indicator and the ends of the graduations, measured along the line of the graduations, shall be not more than 1.0 mm (0.04 in).

S.1.4.3. Width. – The width of the index of an indicator in relation to the series of graduations with which it is used shall be not greater than:

(a) the width of the narrowest graduation;
[Nonretroactive as of January 1, 2002]

(b) the width of the clear space between weight graduations; and

(c) three-fourths of the width of the clear space between money-value graduations.

When the index of an indicator extends along the entire length of a graduation, that portion of the index of the indicator that may be brought into coincidence with the graduation shall be of the same width throughout the length of the index that coincides with the graduation.

S.1.4.4. Clearance. – The clearance between the index of an indicator and the graduations shall in no case be more than 1.5 mm (0.06 in).

S.1.4.5. Parallax. – Parallax effects shall be reduced to the practicable minimum.

S.1.8. Computing Scales.

S.1.8.1. 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:

(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.

Value figures and graduations shall not be duplicated in any column or row on the graduated chart. (Also see S.1.8.2. Money-Value Computation.)

S.1.8.2. Money-Value Graduations, U.S. Customary Unit Prices. – The value of the graduated intervals representing money-values on a computing scale with analog indications shall not exceed:

(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.

Value figures and graduations shall not be duplicated in any column or row on the graduated chart. (Also see S.1.8.2. Money-Value Computation.)

S.1.8.3. 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. (Also see Sec. 1.10. General Code G-S.5.5. Money-Values, Mathematical Agreement.)

S.1.8.4. Customer's Indications. – Weight indications shall be shown on the customer's side of computing scales when these are used for direct sales to retail customers. Computing scales equipped on the operator's side with digital indications, such as the net weight, unit price, or total price, shall be similarly equipped on the customer's side. Unit price displays visible to the customer shall be in terms of single whole units of weight and not in common or decimal fractions of the unit. Scales indicating in metric units may indicate price per 100 g.

(Amended 1985 and 1995)

S.1.8.4.1. *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.*

[Nonretroactive as of January 1, 2001]

(Added 1999)

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

(a) the net weight; [1]

(b) the unit price;[1]

(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.

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Amended 1989, 1991, 1993, and 2019)

Table S.1.11. Categories of Device and Methods of Sealing

Categories of Devices	Method of Sealing
Category 1: No remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.	The 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.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).	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 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter).

[Nonretroactive as of January 1, 1995] (Table added 1993)

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

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.*

*[Nonretroactive as of January 1, 1993] [*Nonretroactive as of January 1, 2005]*

(Added 1992) (Amended 2004)

S.2. Design of Balance, Tare, Level, Damping, and Arresting Mechanisms.

S.2.1. Zero-Load Adjustment.

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.

Except for an initial zero-setting mechanism, an automatic zero adjustment outside the limits specified in S.2.1.3. Scales Equipped with an Automatic Zero-Tracking Mechanism is prohibited.
(Amended 2010)

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.

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 plus or minus:

(a) 3.0 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, and for all axle load, railway track, and vehicle scales; or

(b) 1.0 scale division for all other scales.

S.2.1.3. Scales Equipped with an Automatic Zero-Tracking Mechanism.

S.2.1.3.1. Automatic Zero-Tracking Mechanism 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 for:

(a) bench, counter, and livestock scales: 0.6 scale division;

(Amended 2005)

S.2.1.3.2. Automatic Zero-Tracking Mechanism 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:

(a) for vehicle, axle load, and railway track scales: 3.0 scale divisions; and

(b) for all other scales: 0.5 scale division.

(Added 2005)

(Added 1999) (Amended 2005)

(Amended 1999)

S.2.1.5. Initial Zero-Setting Mechanism. – Scales of accuracy Classes I, II, and III may be equipped with an initial zero-setting device.

(a) For weighing, load-receiving, and indicating elements in the same housing or covered on the same CC, an initial zero-setting mechanism shall not zero a load in excess of 20 % 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.

(b) For indicating elements not permanently attached to weighing and load-receiving elements covered on a separate CC, the maximum initial zero-setting mechanism range of electronic indicators shall not exceed 20 % of the configured capacity.

[Nonretroactive as of January 1, 2009]

(Added 2008)

(Added 1990) (Amended 2008)

S.2.1.6. Combined Zero-Tare ("0/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."

(Added 1998)

[Direct sale – A sale in which both parties in the transaction are present when the quantity is being determined. An unattended automated or customer-operated weighing or measuring system is considered to represent the device/business owner in transactions involving an unattended device.]

S.2.3. Tare. – *On any scale (except a monorail scale equipped with digital indications and multi-interval scales or multiple range scales when the value of tare is determined in a lower weighing range or weighing segment), the value of the tare division shall be equal to the value of the scale division.** The tare mechanism shall operate only in a backward direction (that is, in a direction of underregistration) with respect to the zero-load balance condition of the scale. *A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated. * [*Nonretroactive as of January 1, 1983]*

(Amended 1985 and 2008)

***Note**: On a computing scale, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a complete weighing operation, including tare, net, and gross weight determination.** [*Nonretroactive as of January 1, 1983]*

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 tilted up to and including 5 % rise over run in any direction from a level position and rebalanced. The level-indicating means shall be readable without removing any scale parts requiring a tool.

(Amended 1991 and 2008)

[Not maintaining a scale in a level condition may affect performance and is a common violation. When found, it should be brought to the attention of the device owner or user and have them level the scale before proceeding with the test. The violation should be documented on the report as reoccurring violations may require additional enforcement action.]

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.

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 plus or minus:

(b) 1.0 scale division for all other scales.

The values recorded shall be within applicable tolerances.

(Amended 1995)

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 1000 kg (2000 lb) capacity, as determined by the factory adjustment, shall be accurately, clearly, and permanently defined.
(Amended 1986)

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.*
[Nonretroactive as of January 1, 1986]

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.*
[Nonretroactive as of January 1, 1986]

S.5.3. Multi-Interval and Multiple 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."[4]
(Added 1986) (Amended 1995)

S.5.4. Relationship of Minimum Load Cell Verification Interval Value to the Scale Division. *– The relationship of the value for the minimum load cell verification scale interval, v_{min}, to the scale division, d, for a specific scale using National Type Evaluation Program (NTEP) certified load cells shall comply with the following formulae where N is the number of*

load cells in a single independent[1] weighing/load-receiving element (such as hopper, railroad track, or vehicle scale weighing/load-receiving elements):

(a) $v_{\min} \leq \frac{d^*}{\sqrt{N}}$ *for scales without lever systems; and*

(b) $v_{\min} \leq \frac{d^*}{\sqrt{N} \times (scale multiple)}$ *for scales with lever systems.*

[1]"Independent" means with a weighing/load-receiving element not attached to adjacent elements and with its own A/D conversion circuitry and displayed weight.

*[*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.]*

This requirement does not apply to complete weighing/load-receiving elements or scales, which satisfy all the following criteria:

- *the complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the 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.*

[Nonretroactive as of January 1, 1994]

(Added 1993) (Amended 1996 and 2016)

Table 3.

Parameters for Accuracy Classes

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

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

(Added 1986) (Amended 2003)

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

(Added 1997)

[*Nonretroactive as of January 1, 1986*]

(Amended 1986, 1987, 1997, 1998, 1999, 2003, and 2004)

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S.6. Marking Requirements. – (Also see G-S.1. Identification, G-S.4. Interchange or Reversal of Parts, G-S.6. Marking Operational Controls, Indications, and Features, G-S.7. Lettering, G-UR.2.1.1. Visibility of Identification, and UR.3.4.1. Use in Pairs.)

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 in Section 1.10. General Code, G-S.1. Identification and Section 2.20. Scales Code, S.6. Marking Requirements 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.

(Added 1989)

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 (NTEP), 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. Marking Requirements and explained in the accompanying notes in Table S.6.3.b. Notes for Table S.6.3.a.

(Added 1990)

Table S.6.3.a.
Marking Requirements

To Be Marked With ⇓	Weighing Equipment				
	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 and Prefix (14)(20)(22)(24)		X	X		

Note: For applicable notes, 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.

(Added 2001)

(Added 1990) (Amended 1992, 1999, 2000, 2001, 2002, and 2004)

Table S.6.3.b.
Notes for Table S.6.3.a. Marking Requirements

1. Manufacturer's identification and model designation and *model designation prefix.**
   *[*Nonretroactive as of January 1, 2003*]
   (Also see G-S.1. Identification.) *[Prefix lettering may be initial capitals, all capitals or all lower case]*
   (Amended 2000)

2. *Serial number [Nonretroactive as of January 1, 1968] and prefix [Nonretroactive as of January 1, 1986].* (Also see G-S.1. Identification.)

3. 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 × 0.005 kg, 30 × 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.*
   [Nonretroactive as of January 1, 1983]
   (Amended 2005)

4. *Required only if different from "d."*
   [Nonretroactive as of January 1, 1986]

5. *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). [Nonretroactive as of January 1, 1986]*
   (Amended 1999)

6. *This value may be stated on load cells in units of 1000; e.g., n: 10 is 10 000 divisions.*
   [Nonretroactive as of January 1, 1988]

7. *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.*
   [Nonretroactive as of January 1, 1988]
   (Amended 1999)

8. *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.*
   [Nonretroactive as of January 1, 1988]

9. *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.*
   [Nonretroactive as of January 1, 1989]
   (Amended 2002)

10. Necessary to the weighing system but having no metrological effect, e.g., auxiliary remote display, keyboard, etc.

11. *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. [Nonretroactive as of January 1, 1988] The manufacturer's name or trademark, the model designation, and identifying symbols for the model and serial numbers as required by paragraph G-S.1. Identification shall also be marked both on the load cell and in any accompanying document.*

Table S.6.3.b.
Notes for Table S.6.3.a. Marking Requirements

[Nonretroactive as of January 1, 1991]

12. 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."**
*[*Nonretroactive as of January 1, 1989]*

(Amended 2002)

13. *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.
*[*Nonretroactive as of 1986]*

(Amended 1994 and 2003)

14. 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.
*[*Nonretroactive as of January 1, 2003]*

(Amended 2002)

15. *Required if the direction of loading the load cell is not obvious.*
[Nonretroactive as of January 1, 1988]

16. *Serial number [Nonretroactive as of January 1, 1968] and prefix [Nonretroactive as of January 1, 1986].* (Also see G-S.1. Identification.) 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.

17. *The accuracy class of a device shall be marked on the device with the appropriate designation as I, II, III, III L, or IIII.*
[Nonretroactive as of January 1, 1986]

18. The nominal capacity shall be conspicuously marked as follows:
    (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) on the load-receiving element (weighbridge) of vehicle, axle-load, and livestock scales.**
    *[*Nonretroactive as of January 1, 1989]*

    (Amended 1992)

19. *For weighing and load-receiving elements not permanently attached to indicating element or covered by a separate CC.*
[Nonretroactive as of January 1, 1988]

(Amended 1992)

20. *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.*
[Nonretroactive as of January 1, 2000]

Table S.6.3.b.
Notes for Table S.6.3.a. Marking Requirements

(Added 1999)

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}.*
[Nonretroactive as of January 1, 2001]

(Added 1999)

22. *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.*
[Nonretroactive as of January 1, 2003]

(Added 2002) (Amended 2003)

***Note**: The marked section capacity for livestock weighing may be less than the marked CLC for vehicle weighing.*

(Amended 2003)

23. *Required only if a CC has been issued for the device or equipment.*
[Nonretroactive as of January 1, 2003]

(G-S.1. Identification (e) Added 2001)

24. *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.*
[Nonretroactive as of January 1, 2005]

(Added 2004)

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.

(Added 2003)

N. Notes

N.1. Test Procedures.

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.

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.

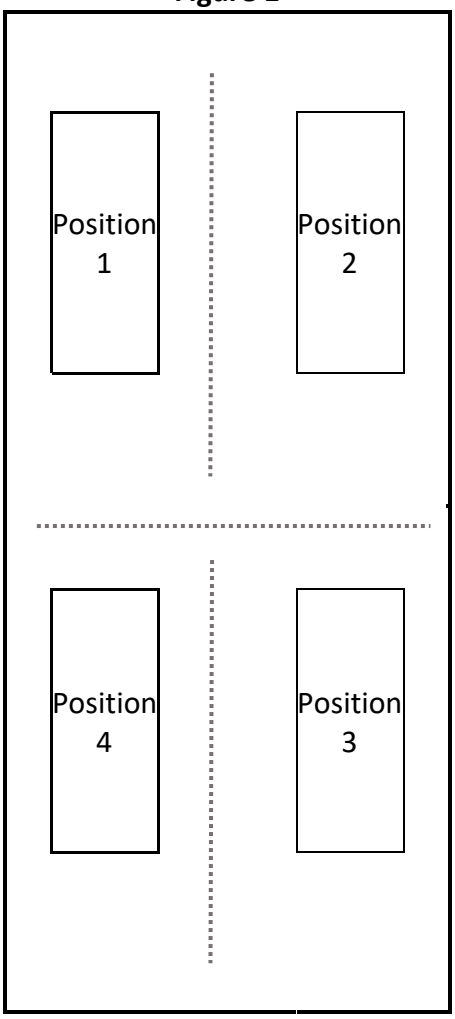
N.1.2.1. Scales Marked I, II, III, or IIII. – Except for portable wheel load weighers, decreasing load tests shall be conducted on scales marked I, II, III or IIII and with "n" equal to or greater than 1000 with test loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, at test loads equal to 4000 d, 2000 d, and 500 d; 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. (Also see Table 6. Maintenance Tolerances.)

N.1.3. Shift Test.

N.1.3.7. 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. A single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element.

(a) For scales with a nominal capacity of 500 kg (1000 lb) or less, a shift test shall be conducted using a one third nominal capacity test load (defined as test weights in amounts of at least 30 % of scale capacity, but not to exceed 35 % of scale capacity) centered as nearly as possible at the center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1.

Figure 1



(Amended 1987, 2003, and 2007)

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-Tracking Mechanism (AZT), the discrimination test may be conducted at a range outside of the AZT range.*
[Nonretroactive as of January 1, 1986]

(Added 1985) (Amended 2004)

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."

(Added 1986)

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. (Also see GUR.4.2. Abnormal Performance.)

N.2. Verification (Testing) Standards. – Field standard weights used in verifying weighing devices shall comply with requirements of NIST Handbook 105-Series standards (or other suitable and designated standards) or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one third- of the smallest tolerance applied).

(Amended 1986)

N.3. Minimum Test Weights and Test Loads. – The minimum test weights and test loads for in service tests (except railway track scales) are shown in Table 4. (Also see Footnote 2 in Table 4. Minimum Test Weights and Test Loads.)

(Added 1984) (Amended 1988)

Table 4.
Minimum Test Weights and Test Loads[1]

Devices in Metric Units				Devices in U.S. Customary Units		
Device Capacity (kg)	Minimums (in terms of device capacity)			Device Capacity (lb)	Minimums (in terms of device capacity)	
	Test Weights (greater of)	Test Loads[2]			Test Weights (greater of)	Test Loads[2]
0 to 150 kg	100 %			0 to 300 lb	100 %	
151 to 1 500 kg	25 % or 150 kg	75 %		301 to 3 000 lb	25 % or 300 lb	75 %
1 501 to 20 000 kg	12.5 % or 500 kg	50 %		3001 to 40 000 lb	12.5 % or 1 000 lb	50 %
20 001 kg+	12.5 % or 5 000 kg	25 %[3]		40 001 lb+	12.5 % or 10 000 lb	25 %[3]

Where practicable:

- Test weights to dial face capacity, 1000 d, or test load to used capacity, if greater than minimums specified.
- During initial verification, a scale should be tested to capacity.

Table 4.
Minimum Test Weights and Test Loads[1]

[1] If the amount of test weight in Table 4 combined with the load on the scale would result in an unsafe condition, then the appropriate load will be determined by the official with statutory authority.

[2] The term "test load" means the sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution test methods. Not more than three substitutions shall be used during substitution testing, after which the tolerances for strain load tests shall be applied to each set of test loads.

[3] The scale shall be tested from zero to at least 12.5 % of scale capacity using known test weights and then to at least 25 % of scale capacity using either a substitution or strain load test that utilizes known test weights of at least 12.5 % of scale capacity. Whenever practical, a strain load test should be conducted to the used capacity of the scale. When a strain load test is conducted, the tolerances apply only to the test weights or substitution test loads.

(Amended 1988, 1989, 1994, and 2003)

Note: GIPSA requires devices subject to their inspection to be tested to at least "used capacity," which is calculated based on the platform area of the scale and a weight factor assigned to the species of animal weighed on the scale. "Used capacity" is calculated using the formula:

Used Scale Capacity = Scale Platform Area × Species Weight Factor

Where species weight factor = 540 kg/m^2 (110 lb/ft^2) for cattle, 340 kg/m^2 (70 lb/ft^2) for calves and hogs, and 240 kg/m^2 (50 lb/ft^2) for sheep and lambs.

T. Tolerances Applicable to Devices not 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. Tolerances for Unmarked Scales. (Amended 1990)

Table T.1.1. Tolerances for Unmarked Scales						
Type of Device	**Subcategory**	**Minimum Tolerance**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Decreasing-Load Multiplier**	**Other applicable Requirements**
All other scales including grain hopper	n > 5000	0.5 d or 0.05 % of scale capacity, whichever is less	0.05% of test load	0.1% of test load	1.5	T.N.2.5., T.N.4.1., T.N.4.2., T.N.4.3., T.N.5., T.N.7.2., *T.N.8.1.4.*[4], T.N.9.
	n ≤ 5000	Class III, T.N.3.1., Table 6 and T.N.3.2.			1.0	T.N.2., T.N.3., T.N.4.1., T.N.4.2., T.N.4.3., T.N.5., T.N.7.2., *T.N.8.1.4.*[4], T.N.9
[1] The decreasing load test applies only to automatic indicating scales. [2] If marked and tested as a pair, the tolerance shall be applied to the sum of the indication.			[3] The decreasing load test does not apply to portable wheel load weighers. [4] *T.N.8.1.4. Operating Temperature. is nonretroactive and effective for unmarked devices manufactured as of January 1, 1981.*			

T.2. Sensitivity Requirement (SR).

T.2.1. Application. – The sensitivity requirement (SR) is applicable to all nonautomatic indicating scales not marked I, II, III, III L, or IIII, and is the same whether acceptance or maintenance tolerances apply.

T.2.2. General. – Except for scales specified in paragraphs T.2.3. Prescription Scales through T.2.8. Railway Track Scales: 2 d, 0.2 % of the scale capacity, or 40 lb, whichever is least.

T.2.3. Prescription Scales. 6 mg (0.1 grain).

T.N. Tolerances Applicable to Devices Marked I, II, III, III L, and 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 (zero net weight indication); the tolerance values apply to the net weight indication for any possible tare load using certified test loads.

(Amended 2008)

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. (Also see G-N.2. Testing with Nonassociated Equipment.)

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.3. Tolerance Values.

T.N.3.1. Maintenance Tolerance Values. – The maintenance tolerance values are as specified in Table 6. Maintenance Tolerances.

T.N.3.2. Acceptance Tolerance Values. – The acceptance tolerance values shall be one-half the maintenance tolerance values.

Table 6.
Maintenance Tolerances
(All values in this table are in scale divisions)

Tolerance in Scale Divisions				
	1	**2**	**3**	**5**
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 +
III L	0 - 500	501 - 1 000	(Add 1 d for each additional 500 d or fraction thereof)	

T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc. – If a main element separate from a complete weighing device is submitted for laboratory type evaluation, the tolerance for the main element is 0.7 that for the complete weighing device. This fraction includes the tolerance attributable to the testing devices used.

(Amended 2015)

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.

(Amended 1986)

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, weigh beam 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.

(Amended 1986)

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.

(Amended 1986)

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.

(Added 1986)

Example:

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.

(Amended 1989 and 2005)

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 four hours shall not exceed the absolute value of the maximum permissible error at the load applied.

(Added 2005) (Amended 2006 and 2010)

T.N.4.5.3. Zero Load Return: Non-automatic Weighing Instruments. – A non-automatic weighing instrument 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). 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:

(b) 0.5 e for Class III devices with 4000 or fewer divisions,

(c) 0.83 e for Class III devices with more than 4000 divisions, or

For a multi-interval instrument, the deviation shall not exceed 0.83 e_1 (where e_1 is the interval of the first weighing segment of the scale).

On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed 0.83 e_i (interval of the weighing range). 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 five minutes.

(Added 2010)

T.N.6.1. Test Load.

(b) For all other nonautomatic-indicating scales, the test load for sensitivity shall be 1 d at zero and 2 d at maximum test load.

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:

Scale of Class III or IIII with a maximum capacity of 30 kg (70 lb) or less: 2 mm (0.08 in),

Scale of Class III, III L, or IIII with a maximum capacity of more than 30 kg (70 lb): 5 mm (0.20 in);

(Amended 1987)

T.N.7. Discrimination.

T.N.7.2. Digital Automatic Indicating. – A test load equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 2.0 d. This requires the zone of uncertainty to be not greater than three-tenths of the value of the scale division. (Also see N.1.5.1. Digital Device.)

UR. User Requirements

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division, minimum capacity, and computing capability.

UR.1.1. General.

(a) For devices marked with a class designation, the typical class or type of device for particular weighing applications is shown in Table 7a. Typical Class or Type of Device for Weighing Applications.

(b) For devices not marked with a class designation, Table 7b. Applicable to Devices not Marked with a Class Designation applies.

Table 7a.
Typical Class or Type of Device for Weighing Applications

Class	Weighing Application or Scale Type
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, grain-hopper scales, animal scales, postal scales, vehicle on-board weighing systems with a capacity less than or equal to 30 000 lb, and scales used to determine laundry charges
Note: A scale with a higher accuracy class than that specified as "typical" may be used.	

(Amended 1985, 1986, 1987, 1988, 1992, 1995, and 2012)

Table 7b.
Applicable to Devices Not Marked with a Class Designation

Scale Type or Design	Maximum Value of d
Retail Food Scales, 50 lb capacity and less	1 oz

(Added 1985) (Amended 1989)

UR.1.3. Value of the Indicated and Recorded Scale Division. – *The value of the scale division as recorded shall be the same as the division value indicated.*
[Nonretroactive as of January 1, 1986]
(Added 1985) (Amended 1999)

UR.2. Installation Requirements.

UR.2.1. Supports. – A scale that is portable and that is being used on a counter, table, or the floor shall be so positioned that it is firmly and securely supported.

[This is important not only for scale performance but for safety. Ensure the counter or table can support the scale and test weights.]

UR.2.3. Protection From Environmental Factors. – The indicating elements, the lever system or load cells, and the load-receiving element of a permanently installed scale, and the indicating elements of a scale not intended to be permanently installed, shall be adequately protected from environmental factors such as wind, weather, and RFI that may adversely affect the operation or performance of the device.

[Air Conditioning vents or fans may not be in operation but consider the impact they may have on the performance of the scale while they are operating.]

UR.2.10. Primary Indicating Elements Provided by the User. – Video display terminals and other user-provided indicating elements on scales interfaced with a cash register in a point-of-sale (POS) system shall comply with the minimum height requirements specified in part (c) of paragraph S.1.1.1. Digital Indicating Elements.
[Nonretroactive as of January 1, 2021]
(Added 2019)

UR.3. Use Requirements.

UR.3.1. Recommended Minimum Load. – A recommended minimum load is specified in Table 8 since the use of a device to weigh light loads is likely to result in relatively large errors.

Table 8. Recommended Minimum Load		
Class	**Value of Scale Division (d or e*)**	**Recommended Minimum Load (d or e*)**
III	All**	20
* For Class III and IIII devices the value of "e" is specified by the manufacturer as marked on the device; "e" must be less than or equal to "d." **A minimum load of 10 d is recommended for a weight classifier marked in accordance with a statement identifying its use for special applications.		

(Amended 1990)

UR.3.2. Maximum Load. – A scale shall not be used to weigh a load of more than the nominal capacity of the scale.

UR.3.5. Special Designs. – A scale designed and marked for a special application (such as a prepackaging scale or prescription scale with a counting feature) shall not be used for other than its intended purpose.[5]

(Amended 2003)

UR.3.6. Wet Commodities. – Wet commodities not in watertight containers shall be weighed only on a scale having a pan or platform that will drain properly.

(Amended 1988)

[5] Prepackaging scales and prescription scales with a counting feature (and other commercial devices) used for putting up packages in advance of sale are acceptable for use in commerce only if all appropriate provisions of NIST Handbook 44 are met. Users of such devices must be alert to the legal requirements relating to the declaration of quantity on a package. Such requirements are to the effect that, on the average, the contents of the individual packages of a particular commodity comprising a lot, shipment, or delivery must contain at least the quantity declared on the label. The fact that a prepackaging scale may overregister, but within established tolerances, and is approved for commercial service is not a legal justification for packages to contain, on the average, less than the labeled quantity. [NTEP certification may also be required depending on the laws and regulations of individual jurisdictions.]

(Amended 2003)

UR.3.9. Use of Manual Weight Entries. – Manual gross or net weight entries are permitted for use in the following applications only when:

(a) a point-of-sale system interfaced with a scale is giving credit for a weighed item;

(b) an item is pre-weighed on a legal for trade scale and marked with the correct net weight;

(c) a device or system is generating labels for standard weight packages;

(d) postal scales or weight classifiers are generating manifests for packages to be picked up at a later time; or

(e) livestock and vehicle scale systems generate weight tickets to correct erroneous tickets.

(Added 1992) (Amended 2000 and 2004)

UR.4. Maintenance Requirements.

UR.4.1. Balance Condition. – The zero-load adjustment of a scale shall be maintained so that, with no load on the load-receiving element and with all load-counterbalancing elements of the scale (such as poises, drop weights, or counterbalance weights) set to zero, the scale shall indicate or record a zero balance condition. A scale not equipped to indicate or record a zero-load balance shall be maintained in balance under any no-load condition.

UR.4.2. Level Condition. – If a scale is equipped with a level-condition indicator, the scale shall be maintained in level.

UR.4.3. Scale Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a scale shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and by the weights and measures authority having jurisdiction over the scale.

(Amended 1996)

2022 Examination Procedure Outline
Retail Computing Scales

SAFETY NOTES

At a minimum, the following safety equipment and information is needed prior to beginning the inspection. Jurisdiction and Site-specific requirements must be observed.

Check the inspection site carefully for safety hazards and take appropriate precautions.

- Learn the nature of hazardous products used at, or near, the inspection site.
- Use personal protection equipment appropriate for the inspection site.
- Be sure that a first aid kit is available and that the kit is appropriate for the type of inspection activity.

2022 Examination Procedure Outline **Retail Computing Scales**
It is recommended that this outline be followed as minimum criteria for examining retail computing scales. Non-Retroactive requirements are designated by a date designation, e.g., (1/1/85).
Safety Notes: At a minimum, the following safety equipment and information is needed prior to beginning the inspection. Jurisdiction and Site-specific requirements must be observed. Check the inspection site carefully for safety hazards and take appropriate precautions. • Learn the nature of hazardous products used at, or near, the inspection site. • Use personal protection equipment appropriate for the inspection site. • Be sure that a first aid kit is available and that the kit is appropriate for the type of inspection activity.
Inspection: Key points of the inspection is to ensure that the retail computing scale is traceable to an NTEP CC, if applicable, is suitable for its application and has been installed correctly. It is recommended that is not suitable for its application, except under certain conditions, e.g., consumer complaint investigation, not be tested. A device that is not suitable may still be accurate and it is best to avoid explaining why an “accurate” device cannot be used in the application.
Pre-Inspection Requirements: The Official must have a copy of the latest edition of all applicable weights and measures laws for the state or jurisdiction. It is important to have read and to be familiar with these documents. **Additionally, prior to citing a section of the law, the specific section should be reviewed and cited directly from the law.**

First Steps

- Test equipment includes, but is not limited to:
- Certified test weights sufficient to test the scale to full capacity
- Flashlight
- Mirror with extension (required information is often on the back of the scale and a mirror allows seeing the information without having to move the scale.
- A copy of NIST HB-44 edition adopted by the state or jurisdiction. Requirements contained in later editions of HB-44 cannot be enforced if not adopted into law by the jurisdiction.

- Proper safety and test equipment appropriate for the location. Inquire about any site-specific safety requirements with management prior to beginning the inspection and test.

- Identify yourself to the manager and show official identification.
- Explain the purpose of your visit.
- Verify scale licenses are current (if applicable).
- If the site has multiple scales (e.g., a grocery store) ask if the manager has a preference on where you will begin your inspection.

SUITABLITY OF TEST EQUIPMENT

- Review the NTEP Certificate of Conformance Applicability section to determine if it is suitable for its intended use.
- Review the features listed on the NTEP Certificate of Conformance and determine which features are in use and should be tested.
- Determine capacity of the retail computing scale and its scale division to determine if it meets minimum load requirements.

INITIAL INSPECTION

- Perform visual inspection of the scale, its zero-balance condition, level condition and supports.
- Determine if the scale has a security seal.

Conduct of Test		
HB-44 Section	HB-44 Code References	Notes-Additional Information
1. Zero-Load balance as found. Check to determine if tare is being properly taken.	S.1.1., UR.4.1., S.2.1.1., S.2.1.2., G-S.5.2.2. (d) (1/1/86)	
General Considerations		

Selection	G-UR.1.	
Installation	G-UR.2.1., G-UR.2.11, G-UR.2.2., UR.2.2.	
Supports and Clearance	UR.2.1., UR.2.4.	
Accessibility for inspection, testing, and sealing.	G-UR.2.3.	
Testing device at a central location.	G-UR.4.6.	
Assistance	G-UR.4.4.	
Position, Customer Readability	G-UR.3.3., S.1.8.3.	
Level Indicating means and condition	S.2.4., UR.4.2.	
Maintenance, use, and environmental factors, cleanliness, obstructions, modifications, etc.	G-S.2., G-UR.1.2., G-UR.3.1., G-UR.3.2., UR.3.5., G-UR.4, UR.2.3., UR.4.3.	
Marking		
Marking	S.6.3., S.5.1. (1/86), S.6.2., G-S1.1. (1/1/04), G-S.5.2.4.	
Identification	G-S.1.	
Name, initials, or trademark of manufacturer or distributor.	Retroactive	
Model identifier	Retroactive	
Model identifier prefix, acceptable abbreviation for “model” and “number”	G-S.1.	
Current Software version or identifier preface (not-built-for-purpose software based devices.)		
Software version or identifier preface (for not-built-for-purpose software-based devices.)		

Acceptable abbreviations for version, revision, and number		
NTEP CC prefix and number for devices that have an NTEP CC		
Devices or main elements remanufactured after January 1, 2002 Name, initials, or trademark of last remanufacture or distributor, model designation if different from original model designation.	G-S.1.2.	
Lettering	G-S.7.	
Operation controls, indications and features.	G-S.6. (1/1/77)	
Visibility of identification	G-UR.2.1.1.	
Interchange or reversal of parts	G-S.4.	
Weighing, load-receiving, and indicating element in same housing or covered on the same CC	S.6.3.	
Accuracy class		
Nominal capacity		
Value of scale division with nominal capacity Value of “e” if different than “d”		
Temperature limits if narrower than and within -10˚C to 40˚C (14˚F to 104˚F)		
Scale designed for special purposes		
Indicating element not permanently attached or covered on separate CC		

Accuracy class		
Nominal capacity		
Value of scale division with nominal capacity Value of “e” if different than “d”		
Temperature limits if narrower than and within -10˚C to 40˚C (14˚F to 104˚F)		
Scales designed for special purposes		
Maximum number of scale divisions (n_{max})		
Weighing and load-receiving element not permanently attached or covered on separate CC		
Accuracy class		
Nominal capacity		
Value of scale division with nominal capacity Value of “e” if different than “d”		
Temperature limits if narrower than and within -10˚C to 40˚C (14˚F to 104˚F)		
Scale designed for special purposes		
Value of scale division with nominal capacity Value of “e” if different than “d”		
Load cell with Certificate of Conformance	S.6.3., S5.4.	
Manufacturer’s name or trademark, model designation, model prefix, and serial number and	Requires information on a data plate attached to the load cell or in an	

prefix shall also be marked on both the load cell and in any accompanying documents.	accompanying document. If a document is provided, the serial number shall appear on the load cell and the document.	
Accuracy Class		
Temperature limits if narrower than and within -10˚C to 40˚C (14˚F to 104˚F)		
Maximum number of divisions		
"S" or "M" for single or multiple cell applications		
Direction of loading if not obvious		
Minimum dead load, maximum capacity, safe load limit, and load cell verification interval, (V_{min})		
V_{min} stated in mass units		
Indicator and recording elements		
Value of scale division	S.1.2. (1/1/86), S.1.2.1. (1/1/89), S.1.2.2.1., S.1.2.2.2., S.5.3., UR.1.1. (b), G-S5.3.,G-S.5.3.1., UR1.3. (1/1/86)	
Customer indications	S.1.8.4.	
Prepackaging scales only	S.1.9.1.	
Value of tare division	S.2.3. (1/1/83)	
Tare mechanism	S.2.3.	
Combined zero-tare key	S.2.1.6.	
Appropriateness of design	G-S.3., G-S.5., S.1.3., S.1.4., S.1.8.1., S.1.8.2., S.1.8.3. (1/1/010, S.1.9.2., S.5.2., S.5.4. (1/1/94)	
Recorded representations	G-S.5.6.	
Suitability for use	G-UR.1.1, UR.1.	
Damping means	S.2.5.	
Adjustable components	S.1.10.	

Provision for sealing	S.1.11.(b) (1/1/90), S.1.11.(c) (1/1/95), G-S.8. (1/1/90) S.1.8.4.1. (1/1/01), G-UR.4.5.	
Weighing Elements		
Antifriction means	S.4.1.	
Adjustable components	S.4.2.	
Multiple load-receiving elements	S.4.3.	
Drainage, if wet commodities are weighed	S.3.2., UR.3.6.	
Scoop counterbalances	S.3.3.	
PRETEST DETERMINATIONS		
Tolerances		
Acceptance/maintenance	G-T.1., G-T.2.	
Application	G-T.3.	
Tolerance Values:	First determine number of scale divisions (n)	Number of scale divisions (n) equals the scale capacity divided by the value of the scale division.
Scale marked with accuracy designation	T.N.2.1., T.N.2.3., T.N.2.4., T.N.3.1., Table 6 (Class III), T.N.3.2., T.N.4.4., T.N.5.	
Scale unmarked and n equals 5,000 divisions or less	T.1.1., T.N.2.1., T.N.2.3., T.N.2.4., T.N.3.1. Table 6 (Class III), T.N.3.2., T.N.4.3., T.N.5.	
Operating temperature unmarked scales	T.N.8.1.4. (1/1/81)	
Discrimination	T.N.7.1, T.N.7.2., N.1.5. (1/1/86), N.1.5.1.	
Accuracy of Field Standards	N.2.	
Minimum Test Weights and Test Loads	N.3., Table 4.	
Test Notes		
Check repeatability of, and agreement between	G-S.5.2.2. (a) (b), T.N.4.3., T.N.5., G-S.5.4.	

indications throughout test		
Recheck zero load balance each time test load is removed	N.1.9., G-UR.4.2.	
Print ticket or label at each test load if equipped with printer and verify effectiveness of motion detection in prohibiting printing when scale is in motion.	S.2.5.1.(b)	
Verify price calculations to the nearest cent	G-S.5.5.	
Verify agreement of displayed indications and recorded representations	G-S.5.2.2., G-S.5.6., S.2.5.1.(b), S.1.8.2.	
Verify displayed and recorded scale division are the same	UR.1.3. (1/1/86)	
Verify that the customer may receive a receipt; printed or electronic	G-S.5.6.	
Electronic scales, if necessary, conduct a zone of uncertainty test	N.1.5.(1/1/86), N.1.5.1., S.1.1.1.(a), S.1.1.1.(b) (1/1/93)	When
Electronic scales, check operational features such as programmable tare, multiplier keys, etc. to ensure all features work properly and to ensure correct transactions	G-UR.4.1., G-UR.4.2., S.4.3., S.1.12. (1/1/93 and 1/1/05), UR.3.9.	
Automatic Zero-Tracking Test		
Discrimination Test		
Increasing load and Shift Test	N.1.1., N.1.3.7. (a)	

1. Increasing-load test with the load approximately centered) at the following minimum test loads (20d): For scales indicating in metric units: 100 g; then at each 500 g to 2.5 kg; at 500 g to 2.5 kg intervals thereafter to an amount equal to the shift-test load (i.e., a test-weight load equal to at least 30 % of scale capacity, but not to exceed 35 % of scale capacity). Include test points equal to 500 d, 2000 d, and 4000 d For other scales: 0.50 lb; then at each pound to 5 lb; at 1 lb, 2 lb, or 5 lb intervals thereafter to an amount equal to the shift-test load, (i.e., a test-weight load equal to at least 30 % of scale capacity, but not to exceed 35 % of scale capacity). -Include test points equal to 500d, 2000d, and 4000 d 2. Shift test: use test weights equal to no less than 30 % of scale capacity, but not to exceed 35% of scale capacity.		
Radio Frequency Interference (RFI)/Electromagnetic Interference (EMI). Conduct test at or near capacity when RFI/EMI transmission sources are present or if a problem is suspected.	G-UR.1.2., G-N.2., G-UR.3.2., G-UR.4.2., N.1.6., T.4., T.N.9.	
Test for over-capacity indication	S.1.17.(a), S.1.7. (b) (1/1/93)	
Test for Electronic Scales		
Test for discrimination at or near capacity (if environmental conditions permit). A test load equivalent to 1.4d shall cause a change in the indicated or	N.1.5. (1/1/86). T.N.7.2.	

recorded value of at least 2.0d		
Decreasing-load test - for scales marked with an accuracy class and having 1000 or more scale divisions (d), test with 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 all other scales, the test load shall be equal to one-half of the maximum load applied in the increasing-load test.	N.1.2., N.1.2.1., or N.1.2.2.	
Recheck zero-load balance	N.1.9., G-UR.4.2.	
Test for proper design of automatic zero-tracking mechanism if the scale is equipped with this feature. Under normal operating conditions the maximum load that can be "rezeroed" when placed on or removed from the platform all at once, shall be 0.6 scale division for scales manufactured between January 1, 1981, and January 1, 2007, and 0.5 scale division for scales manufactured after January 1, 2007	S.2.1.3.1. (a), S.2.1.3.2. (b)	
Check for proper design of tare auto-clear if the scale	S.2.3. (1/1/83)	

is equipped with this feature.		
Check for effectiveness of motion detection if the scale is equipped with a semi-automatic zero-tracking mechanism.	S.2.1.2. (b)	
Establish correct zero-balance condition.	N.1.9., G-UR., 4.2.	
Test for Mechanical Scales		
Increasing-load test (include test loads of 500d, 2000d, and 4000d as part of this test – all test loads approximately centered). For scales that indicate in metric units: test loads of 30 g, 100 g, 200 g, and 500 g For other scales: test loads of 1 oz, 3 oz, 7 oz, and 15 oz or 0.05 lb, 0.15 lb, 0.45 lb, and 0.95 lb Then check: For scales that indicate in metric units - at each 500 g to one quarter capacity. For other scales at each pound to one-quarter capacity.	N.1.1.	
Shift test - use test weights equal to no less than 30 % of scale capacity, but not to exceed 35% of scale capacity	N.1.3.7. (a)	
Continue increasing-load test at one-half, three-	N.1.1.	

quarters, and nominal capacity		
Test for discrimination if environmental conditions permit. A test load equivalent to 1.4.d shall cause a change in the indicated or recorded value of at least 1.0d	N.1.5. (1/1/86) T.N.7.1.	
Decreasing-load test For scales marked with an accuracy class and having 1000 or more scale divisions, test with loads to equal 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. All other scales, test with one-half of the maximum load applied in the increasing-load test.	N.1.2. N.1.2.1.	
Recheck zero-load balance	N.1.9., G-UR.4.2.	
Money-value test. Check chart or drum at several points.	G-S.5.1., G-S.5.5., G-S.5.6.	
Maximum Money Value Interval	**Price / Kilogram**	**Price/Pound**

$0.01	$0.55 or less	$0.25 or less
$0.02	$0.56 to $2.75	$0.26 to $1.25
$0.05	$2.76 to $7.50	$1.26 to $3.40
$0.10	greater than $7.50	greater than $3.40
Money value computation (analog quantity indications/digital money values.	S.1.8.3.	

Retail Computing Scale Checklist

Purpose: This checklist is intended as a quick guide to conducting an inspection and test of a retail computing scale, a means to ensure that all relevant and applicable tests were conducted and to make notes regarding violations and other pertinent information.

Retail Computing Scale Checklist				
Inspection or Test	Description of Test (when applicable)	Inspection or Test Conducted Yes	No	Violations, Additional Notes and Comments. ***Always verify and validate violations with NIST-HB-44 and your jurisdiction's laws***
General Introduction with manager to explain the purpose of the visit, what you will do, determine, in the case of multiple scales, if there is a preference to where you start and to answer any questions about the purpose of the visit and your authority to conduct the inspection				
While with the manager, determine if the scale or system uses pre-programmed tare. You will want to verify that the tare feature operates properly and may want to verify that the tare preprogrammed for items is correct.	Verifying tare is an important function of an inspection. Incorrect tare or not taking tare at all may result in monetary losses for the customer or the store. Ensuring that the scale is accurate but ensuring that the overall transaction is correct should be the goal.			
Visual inspection of the scale, its supports, and any potential safety hazards. To determine if the scale is being used properly observe employees using it if possible.	Accuracy is important, but proper use of the scale is critical to ensure a correct transaction.			

Suitability – if applicable, review the NTEP CC for information regarding application, features, sealing and other relevant information.	Generally, it is advisable not to proceed with a test if the scale is not suitable for its application to avoid having to explain why the scale is accurate but cannot be used. The exception is if you are investigating a complaint. In that case, accuracy may be relevant.			
Ensure that the customer can see the scale's indications and weighing operation.				
Inspect zero-balance and level conditions.	Should the scale be found out of zero-balance or level, it may be a good idea to immediately bring it to the attention of the manager so they can observe it, explain the importance of these requirements, and ensure management and their employees know how to adjust zero and the level condition.			
Check for security seals.				
Check and record required marking information.				
Determine if you have sufficient test standards to conduct the tests.				
Before beginning the test, ensure that the scale is in a proper zero-balance condition				
Determine the applicable tolerances to be applied.	Refer to HB-44 section on tolerances: unmarked, marked, maintenance, acceptance tolerances.			

Increasing-load test. Check for repeatability throughout the test.	Refer to N.1.1. Increasing Load Test and Table 4 for appropriate test loads. Test loads of 1 oz, 3 oz, 7 oz, and 15 oz or 0.05 lb, 0.15 lb, 0.45 lb, and 0.95 lb Then check at each pound to 30% of capacity.			
Verify operational features like programmable tare, manual weight entries, etc. and that recorded representations are correct during the test.				
Test the automatic zero-tracking and width of zero if their performance is questionable.	AZT test: zero scale and apply 0.007 d and the scale must indicate 1 d, e.g., d = 0.01 lb. Apply 0.007 lb and scale should indicate 0.01 lb. A general rule is to repeat three times and if the scale fails three time it should be rejected. The same for the width of zero test. Zero scale, apply 0.7 d and scale must indicate 1 d.			
A discrimination test may be conducted but only under controlled conditions.	See appendix for how to test discrimination. As an example, using a scale with 0.01 lb divisions, the following test may be conducted under controlled conditions, e.g., no air currents, stable temperature, no vibrations, etc. With the			

	device at zero, place decimal weights on the scale equal to 1 d. Zero the scale and place a test load equal to 5 d on the load receiving element. Remove the decimal weights in 0.1d increments until the indication flickers between 0.04 lb and 0.05 lb.			
Shift Test	Refer to N.1.3. Shift Test and figure 1. Use test weights equal to no less than 30 % of scale capacity, but not to exceed 35% of scale capacity			
Decreasing-load test	For class III scales conduct a test at 4000d, 2000d, and 500d Unmarked scales are tested at one-half of maximum load applied during the increasing load-test.			
Check return to zero				
Review test results and verify any violations by reviewing HB-44 for the specific code requirement. Complete the report documenting all violations and other relevant observations, e.g., cashier weighed item without deducting tare.				

In accordance with your jurisdiction's laws and policies, specify corrective action to be taken, time for corrective action and status of scale, approved, rejected, or condemned. Review the report with the manager, provide them a copy and answer any questions they have.				

APPENDIX A

KEY POINTS OF AN INSPECTION

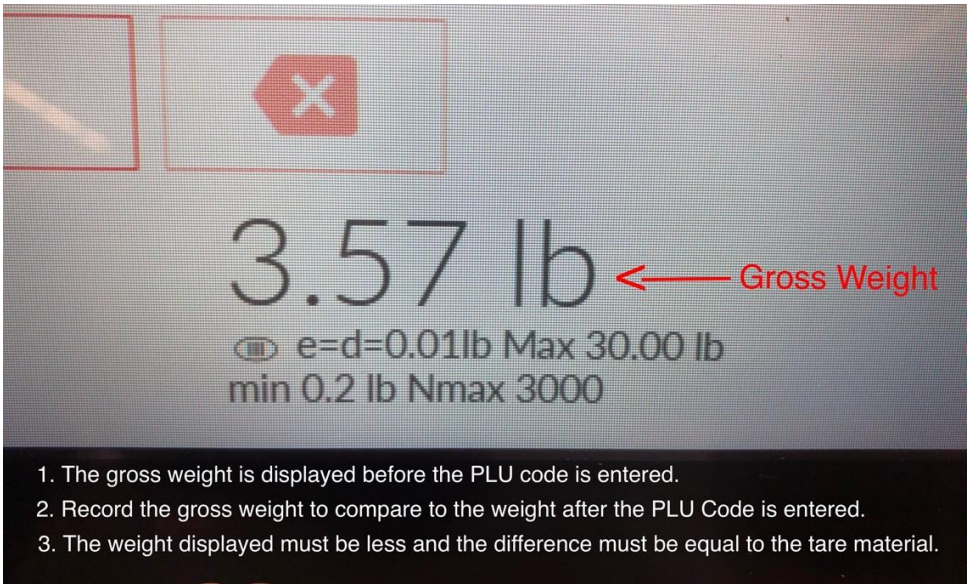
Weights and Measures Officials conduct inspections of weighing and measuring devices. Test of the scale for accuracy is only one component of the overall inspection. A weighing and measuring device may be accurate, but not correct (complying with both tolerances, specifications, and user requirements). The key function of the Weights and Measures Official should be to ensure that the entire transaction while using a weighing and measuring device is accurate in addition to the device being correct.

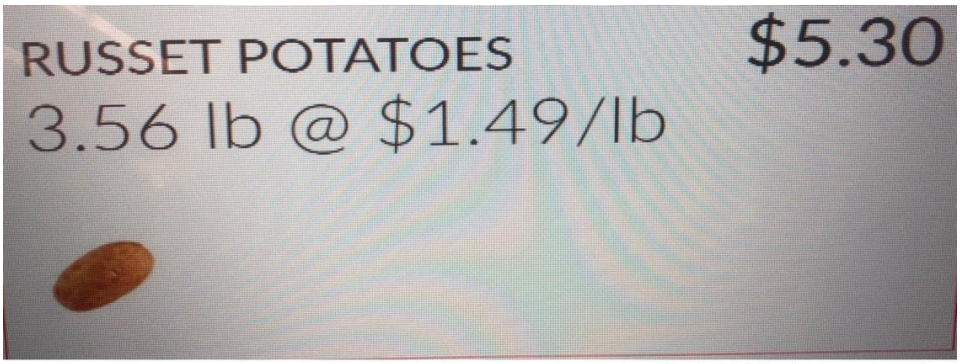
- Observation – Take a moment to observe the weighing operation of the scale(s) upon entering an establishment.
- Introduction to manager – This is a critical component of the inspection. Remember, you represent your agency. Establish yourself as a professional and courteous public servant.
- Explain the purpose of your visit and establish an atmosphere of trust and open dialogue. Encourage the manager to ask questions and be ready to explain the why and what of your visit.
- Be prepared to explain the why behind any violations found. Avoid only citing code violations without explaining what they are, why they are important and what corrective action to be taken.
- Remember, your job is law enforcement, but included in it is also education. Many scale owners are not knowledgeable about using and maintaining scales. Use the inspection as an opportunity to share your knowledge.
- Inquire if the business has their scale(s) routinely inspected by a scale service company. Explain the reason for properly maintaining a scale if they are not already maintaining them.
- Be considerate. For example, if the business only has one scale and there is a line of customers waiting to place an order that requires using the scale, you may want to wait or ask the manager when they are less busy time to return?
    - Use this time to observe key components of using a scale properly.
        - Is the scale positioned so the customer can view the weighing process and indications?
        - Is the scale on level? If not, discretely inform the manager and have him zero the scale before they continue using it.
        - If applicable, are they taking tare?
- Pre-test functions
    - Is the scale properly supported?
    - Is the scale in a zero-load and level condition?
        - If not, do not adjust. Bring it to the attention to the manager and ensure that they understand the importance of maintaining a scale in a zero-load and level condition **and** that they know how to maintain it in a zero-load and level condition.

- Test

- Begin the increasing load test.
  - Observe not only if the scale is within tolerance, but that it is linear in its performance. A scale that begins with errors in one direction and then changes as more weight is applied could indicate a problem that will worsen in time.
  - Check tare and price computation during this test.
- Conduct the shift test at 30% of scale capacity to ensure the scale is within tolerance when the load is not centered.
- Continue to capacity and check that it does not weigh beyond capacity.
- Conduct the decreasing load test.
- Ensure scale returns to zero.
- Discuss the inspection results with the manager. Ask if they have any questions and thank them for their cooperation.
- Leave a copy of the inspection report.
-

Note about Tare: Often the focus of an inspection is on the performance of a scale. Is it within tolerance? This, of course, is important, but a common problem that is equally important is the improper taking of tare or not taking tare. **Products must be sold by net weight, and this requires the subtraction of the tare weight (any packaging material) from the gross weight**. Following is an example of how to verify tare on a self-checkout point-of-sale system.





1. The net weight and product description is displayed after the PLU Code is entered.
2. The weight displayed is 0.01 lb less than previous weight.
3. The product was in a plastic bag weighing less than 0.01 lb. The tare is correct.

Weight displays will vary from system so you may need to ask for management to assist.

The mission of weights and measures is to protect the consumer and ensure equity in the marketplace. It is obvious how the customer is harmed if the proper tare is not taken, but less obvious is how ensuring that tare is taken is fulfilling the mission of ***ensuring equity in the marketplace.***

To illustrate this concept, consider a coffee shop selling coffee by weight. The price is $9.99 per pound. They are open 6 days a week and on average sell 100 pounds of coffee a day. Their coffee bags weigh 0.09 lb. They don't deduct the weight of the bag when weighing the coffee.

The cost to the consumer is 9 cents. However, the ***unearned*** profit to the store is $0.09 X 100 transactions X 312 days = $2,808. This unearned profit can be used by the business for advertising, or employee salaries, or other expenses. This gives them an unfair advantage over other coffee shops in the area that do take tare.

Keep this in mind not only when conducting your inspections but when explaining what your role as a Weights and Measures Official. **This will help businesses to recognize the value you provide not only to the consumer but to business.**

Appendix B

Quantity Versus Quality of Inspections – Taking Shortcuts
By
Richard A. Harshman

Provided by NIST OFFICE OF WEIGHTS AND MEASURES

https://www.nist.gov/news-events/news/2022/09/quantity-versus-quality-inspections-taking-shortcuts

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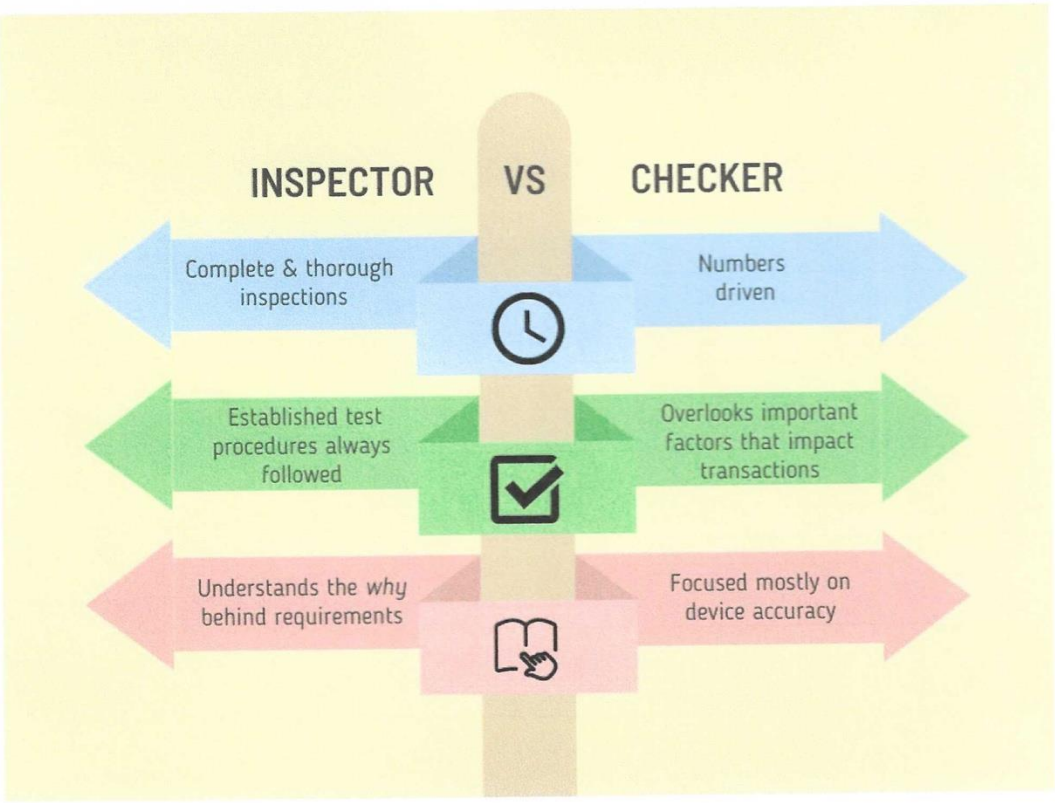
Quantity Versus Quality of Inspections – Taking Shortcuts
September 2022

As weights and measures jurisdictions grapple with finding the right balance in allocating their limited resources, program administrators must carefully consider their choices to ensure they select a sound alternative that does not sacrifice quality and effectiveness for expediency. This article highlights some observations that are based on core weights and measures inspection principles about the impact of reducing inspections to a simple "check" of device accuracy.

Years ago, an administrator for whom I worked proclaimed all weights and measures field officials could be separated into one of two distinct groups, "inspectors and checkers." He bestowed the title "inspector" upon those individuals he believed demonstrated individual work habits that were necessary to properly satisfy the requirements of the position. "Checkers," on the other hand, performed below his standards of expected performance for individuals who held the position.

Inspectors are trained professionals who performed thorough inspections and always followed established test procedures to verify that devices or packages are accurate and ultimately ensure marketplace equity. However, they also understand that specifications and user requirements are just as important as performance requirements and, therefore, enforced them equally. They realize that a critically important aspect of being able to perform a thorough inspection was knowing not only which requirements applied to the equipment or packages they are inspecting but why those requirements were developed in the first place. That is, they know the history supporting each and every requirement in NIST Handbooks 44, 130, and 133 that they are applying. They are not only willing to take the time necessary to make sure that all inspections and tests were completed properly, but also, that device users are selecting, installing, and operating equipment as required. Their work habits result in the disclosure of most violations. They enforce all requirements and take the appropriate action necessary to resolve violations, working to educate device users and obtain compliance.

Checkers focus their work efforts mainly on verifying, or "checking," that devices or packages (in the case of package inspections) are accurate, often ignoring other specifications and requirements that can directly impact the accuracy and transparency of a transaction. To individuals in this group, completing a high number of examinations is far more important than taking the time necessary to find all violations. In their quest for more numbers, they will often take shortcuts, sometimes even developing their own test or inspection procedures to speed the process of getting through an examination so that they can move forward with the next. They often fail to find deficiencies that are not obvious because taking the time to look for them is viewed as a waste of time, since seldom, according to individuals in this group, will those searches actually disclose any problems. For example, a checker might take the time to perform an adequate test on a scale, but neglect to determine whether users are operating the device in accordance with applicable user requirements, such as taking proper tare or starting transactions with the scale on zero. As a result, a scale found to be accurate might receive approval, but its continued use may provide incorrect weights to customers. Checkers prefer to avoid confrontations, which my administrator regarded as a weakness because confrontations were viewed as a natural occurring element of enforcement work and a part of educating device owners and operators.



By describing the work traits of individuals ranked in these two classifications, this particular administrator taught me the personal qualities of a field official that he most favored and the habits that he disliked. It immediately became obvious to me that if I wanted him to regard me as an employee of high esteem, I would need to establish the work habits of an inspector rather than those of a checker.

Whether the field official establishes the work habits of an inspector or a checker (or perhaps some combination of both) ultimately depends upon the actions of management. Field supervisors and administrators alike must not only communicate the expectations of the position; they must also demonstrate their commitment to helping individuals achieve what is expected. If the message being sent through management's actions is that quality and quantity of inspection are equally important, employees will adjust their work habits to achieve those expectations. Likewise, if management's message is that quantity is more important than quality of inspection, employees will adjust the level of quality in their work to provide management what is desired.

Amongst weights and measures administrators today, there are opposing views on how much emphasis to place upon the number of examinations completed versus the quality of those examinations. Most would agree, I think, that numbers are important in that they tend to provide an indication of the amount of work produced within a given program. However, numbers are of no real significance if the results of the examinations associated with them are questionable

because officials failed to follow correct procedures or neglected to complete all portions of the examinations. Particularly if the end result of such shortcuts is inaccurate measurement transactions.

Some interesting questions can be raised regarding those who perform these improper examinations and the programs that advocate their use for the purpose of increasing numbers.

- Who actually benefits from these actions?
- What service is being provided to those (the taxpayers) who fund these programs?
- Why should an enforcement program that finds few violations or produces questionable results continue to be funded?

The duties of field officials not only involve the completion of an adequate number of inspections; these duties also entail following established procedures, searching for hidden deficiencies, and understanding and enforcing all applicable requirements. More simply stated, those are the quality work habits associated with the "inspector" classification.

There is no question that with today's diminishing budgets administrators are faced with more difficult decisions regarding how much emphasis to place on "inspection" activities versus "checking" activities. But one thing that is certain is, if a weights and measures jurisdiction is to retain its value to the marketplace, it must serve more function than a simple test or "check" to determine if a device or package is accurate.

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