FIELD TRAINING MANUAL

Retail Motor Fuel Dispensers

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

NCWM Field Training Manual

Retail Motor Fuel Dispensers

Prepared by:

Constantine Cotsoradis
Measurement and Metrology Strategies, LLC

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ABOUT THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

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 Motor- Fuel Dispenser Manual is based on the 2020 Editions of the National Institute of Standards and Technology Handbook 44 (H-44) and Handbook 130 (H-130).

This Manual does not replace H-44. It serves as a training tool and reference manual for Officials when inspecting or placing commercial devices into service. It provides key elements of H-44 and H-130 and explanations that enable uniform interpretation.

The Manual details applicable H-44 and H-130 code requirements followed by key points when helpful, to provide additional instruction and information.

Not all jurisdictions adopt the most current edition of H-44 or H-130 or in their entirety. Refer to the edition of H-44, H-130 statutes and regulations adopted by your jurisdiction when considering enforcement action.

INTRODUCTION TO H-44

The Introduction section of H-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:

1135 M Street, Suite 100
Lincoln, NE 68508
Phone. (402) 434-4880 | Fax. (402) 434-4878
Email. info@ncwm.com | Website. 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.

All of the specifications, tolerances, and other technical requirements given herein are recommended by NCWM 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.1.1.3. Value of Scale Division Units.
S.1.1.4. Digital Indicating Scales.
S.1.1.5. Graduations.
S.1.1.6. Length.
S.1.1.7. Width.
S.1.1.8. 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 an 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 is 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 MOTOR-FUEL DISPENSER MANUAL

The purpose of this NCWM Manual is to provide the technical requirements of H-44 to properly test and inspect retail motor-fuel dispensers (gas pumps). 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.

NIST has produced two YouTube videos on testing gas pumps. It is recommended that these videos be viewed prior to starting the training and again before reviewing the gas pump EPO.

NIST YOUTUBE VIDEO OF RMFD TEST

https://www.youtube.com/watch?v=m9HG_3SIsEM&feature=youtu.be

NIST VIDEO ANTI-DRAIN TEST

https://www.nist.gov/video/anti-drain-test

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 H-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.

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 H-44 contains the fundamental considerations associated with enforcement of H-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 ensure 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

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[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.

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.

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 inspecting and should check the requirements one by one against the equipment itself. Otherwise, some important requirement maybe 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 an 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

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

first established. The most common example of such gauging is in connection with vehicle tanks 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.)

GENERAL CODE Section 1.10

KEY ELEMENTS OF H-44 GENERAL CODE

- **Applies to all devices except when superseded by a specific code requirement**
- **Applicability of H-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.

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 H-44 apply to:

- 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.

  - **H-44 is applicable to devices use to buy, sell, or determine any charges based on weight or measure.**

- 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 ~~to~~ 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.

- **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 (when applicable) all components of the system (measuring).**

- 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 and 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.

- **H-44 does not have Specific Codes for all devices. Devices not specified in H-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.

SUMMARY: The use of metric equipment is permissible in the United States. H-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.

SUMMARY: This is an important requirement. Most, but not all requirements will be non-retroactive, but some will apply to devices in service before the requirement or after an effective date of the requirement. It is important to take note if the requirement is retroactive or nonretroactive.

NOTE: A non-retroactive rule, law, etc. does not go into effect prior to it being made; a retroactive rule, law, etc. does.

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 H-44. If it was manufactured after the date, it is applicable.**

- **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 H-44 requirements as if it were a new device.**

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

  In this instance, all of the requirements of H-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 H-44 does not carry the force of law until it is adopted into law by a government Agency. Thus, is imperative to understand which edition of H-44 your state has adopted as this will impact what requirements are legally enforceable.**
- **H-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 (permanent is evaluate by NTEP during the evaluation) 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 The Certificate of Conformance(CC) Number shall be: permanently marked on the device; continuously displayed; or accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and

submenu identifications 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 remanufacturers 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 remanufacturers 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 ~~itself~~ 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 for which they have paid or should be paid.**

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.

- **All devices must have a display or a printer (recording device) that can accurately display the measurement.**

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 dial 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 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 vehicle scale with 20-lb divisions must display two zeros (00 LB) and a 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).**

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.

SUMMARY: 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.

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".

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)."

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.

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.

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	M	m	m	M
Kilogram	Kg	kg	kg	KG
Derived SI Units				
Newton	N	N	n	N
Pascal	Pa	Pa	pa	PA
Watt	W	W	w	W
Volt	V	V	v	V
degree Celsius	°C	°C	°c	°C
Other Units				
Liter	l or L	L	l	L
Gram	G	g	g	G
metric ton	T	t	tne	TNE
Bar	Bar	bar	bar	BAR

(Amended 1989 and 1993)

- **All electronic adjustable components that can affect the ***metrological integrity*** (accuracy 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 Database Search at 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" or "meter 1."**

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 H-44 and 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.**

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 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.**
- **NOTE: 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.**

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. Reminder (where do you find this NTEP CC)**

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.**

G-UR.1.3. Liquid-Measuring Devices. – To be suitable for its application, the minimum delivery for liquid-measuring devices shall be no less than 100 divisions, except that the minimum delivery for retail analog devices shall be no less than 10 divisions. Maximum division values and tolerances are stated in the specific codes.

- **A meter indicating in whole gallons is limited to applications where the minimum delivery is equal to or exceeds 100 gallons. This requirement is intended to minimize the impact of errors on small deliveries.**

- **A retail analog meter with a 0.1-gallon division size is limited to minimum deliveries of 1 gallon.**

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.**

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.**

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 when the device is owned by a third-party and they 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.

- **Inspection and testing to ensure the devices are being properly maintained is the key means by which compliance for this requirement is determined.**

- **Devices must be maintained in proper operating condition and adjusted as close to zero as possible. There must not be a bias in one direction or ~~the other~~ 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.**

- **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. See 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.

- **Mobile deliveries e.g., tank trucks, that sell home LP or heating oil/fuel may be tested at a central location.**
- **Devices used for submetering require that the owner or operator not disrupt utility service to the customer or tenant. This is often accomplished by using replacement or temporary meters. These meters must also be tested and conform with applicable requirements of H-44.**

MODIFIED H-44 RETAIL-MOTOR-FUEL DISPENSER CODE

H-44 Section 3.30. Liquid-Measuring Devices

NOTE: Code sections not applicable to Retail Motor-Fuel Devices (RMFD) have been deleted. Refer to H-44 for the entire LMD code. No summaries are provided for code sections that are self-explanatory.

PRE-INSPECTION REQUIREMENTS:

- **The Official must have:**
  - **A copy of the latest edition of all applicable weights and measures laws for their state or jurisdiction.**
  - **A copy of H-44 adopted by the state or jurisdiction. Requirements contained in later editions of H-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.**
    - **Test equipment includes, but is not limited to:**
      - **Properly maintained and calibrated test measures or provers**
      - **Equipment to return product to storage**
      - **Stopwatch**
      - **Flashlight**
      - **Mirror with extension**

SUMMARY OF INSPECTION AND TEST OF RMFD

- **Examine the test measure or prover to ensure it is not damaged (dents will change its volume and it must not be used unless calibrated and certified in that condition).**
- **Examine the inside of the test measure or prover to ensure it is clean.**
- **Ensure that its calibration seal is affixed to the scale and do not use if it is broken. Have it re-calibrated and certified.**
- **Wet the test measure or prover and follow proper drain procedures.**
- **Insert the nozzle into the test measure or prover and properly ground it against the neck.**
- **Dispense product normally in a manner replicating actual use (normal test).**

- **Stop when the dispenser indicates exactly the volume of the test measure or prover you are using, e.g., 5-gallon or 10-gallon. It is often challenging to stop the flow exactly on the exact volume of the test measure or prover so the volume of the test measure or prover for the purposes of applying the tolerance must be adjusted.**
- **Conduct a slow flow test to determine the performance of the meter at lower flow rates which can affect meter performance.**
- **Repeat the tests if the meter is at, near or exceeds the allowable tolerance to ensure the prior test was conducted correctly and accurately represents the meter's performance.**
- **The test measure or prover must be drained properly after each test draft.**
    - **Drain the test measure or prover so that flow stops after 30seconds and then continue to drain for 10 seconds.**
- **Conduct an anti-drain valve test by placing the RMFD in the off position and raising the hose three feet above the nozzle. With the nozzle positioned above the test measure or prover, depress the trigger and observe the flow. It is normal for some product to flow and then step. This is acceptable, however continuous flow is unacceptable.**

DETAILED INSPECTION AND TEST INFORMATION

The first step in an inspection and test of RMFD is to verify its application and suitability.

Review the NTEP CC's application section for specific information regarding types of suitable products. It may be a motor-fuel, but it may be a type of motor-fuel for which the meter is not approved. Visit https://www.ncwm.com/ntep-certificates to search NTEP CCs.

A. Application

A.1. General. – This code applies to:

(a) devices used for the measurement of liquids

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

The inspection for compliance with specifications can begin once it is determined that the RMFD is suitable for its application.

Recommendation: if a device is not suitable for its application it should not be tested to avoid a challenge regarding its suitability if the device proves to be accurate.

The initial inspection to validate are those specifications found in the General Code (a brief summary is provided here. Refer to General Code for additional information):

Some of the identification requirements are non-retroactive so ensure that only those applicable to the RMFD are applied.

- **G-S-1 Identification**
  - **Manufacturer or distributor identification**
  - **Model number**
  - **Non-repetitive serial number**
  - **Current software version or revision identifier**
  - **NTEP CC number**
  - **Maximum and Minimum flow rates**

Additional specifications can be verified once the review of the above are completed.

S. Specifications

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

S.1.1. General. – A liquid-measuring device:

(a) shall be equipped with a primary indicating element; and

(b) may be equipped with a primary recording element.

- **A RMFD must have a display register to indicate the volume dispensed, unit price and total sales. It may be equipped with a recording element, most often, a point-of-sale system (POS) and a cash register. Since these**

devices are connected to a commercial device they too fall under the jurisdiction of weights and measures.

S.1.2. Units. – A liquid-measuring device shall indicate, and record if the device is equipped to record, its deliveries in liters, gallons, quarts, pints, fluid ounces, or binary-submultiples or decimal subdivisions of the liter or gallon.

S.1.2.1. Retail Motor-Fuel Devices. – Deliveries shall be indicated and recorded, if the device is equipped to record, in liters or gallons and decimal subdivisions or fractional equivalents thereof.

S.1.2.3. Value of Smallest Unit. – The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed the equivalent of:

(a) 0.5 L (0.1 gal) on devices with a maximum rated flow rate of 750 L/min (200 gal/min) or less;

(b) 5 L (1 gal) on devices with a maximum rated flow of more than 750 L/min (200 gal/min); or

- **There are General Code requirements for division size, but those above supersede them when there is a conflict. The General Code requirement for division size is as follows:**

G-UR.1.3. Liquid-Measuring Devices. – To be suitable for its application, the minimum delivery for liquid-measuring devices shall be no less than 100 divisions, except that the minimum delivery for retail analog devices shall be no less than 10 divisions. Maximum division values and tolerances are stated in the specific codes.

S.1.3. Advancement of Indicating and Recording Elements. – It shall not be possible to advance primary indicating and recording elements except by the mechanical operation of the device. Clearing a device by advancing its elements to zero is permitted, but only if:

(a) once started, the advancement movement cannot be stopped until zero is reached; and

(b) in the case of indicating elements only, such elements are automatically obscured until the elements reach the correct zero position.

S.1.4. Graduations.

S.1.4.1. Length. – Graduations shall be varied in length so that they may be conveniently read.

S.1.4.2. Width. – In a series of graduations, the width of:

(a) every graduation shall be at least 0.2 mm (0.008 in) but not greater than the minimum clear interval between graduations; and

(b) main graduations shall be not more than 50 % greater than the width of subordinate graduations.

S.1.4.3. Clear Interval Between Graduations. – The clear interval between graduations shall be not less than 1.0 mm (0.04 in). If the graduations are not parallel, the measurement shall be made:

(a) along the line of movement of the tip of the index of the indicator as it passes over the graduations; or

(b) if the indicator extends over the entire length of the graduations, at the point of widest separation of the graduations.

S.1.5. Indicators.

S.1.5.1. Symmetry. – The portion of the index of an indicator associated with the graduations shall be symmetrical with respect to the graduations.

S.1.5.2. Length.

(a) If the indicator and the graduations are in different planes, the index of the indicator shall extend to each graduation with which it is to be used.

(b) If the indicator is in the same plane as the graduations, the distance between the index 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.1.5.3. Width.

(a) The index of an indicator shall not be wider than the width of the narrowest graduation.
[Nonretroactive as of January 1, 2002]

(b) If the index of an indicator extends over the entire length of a graduation, it shall be of uniform width throughout the portion that coincides with the graduation.

S.1.5.4. Clearance. – If the indicator and the graduations are in different planes, the clearance between the index of an indicator and the plane of the graduations shall be no greater than 1.5 mm (0.06 in).

S.1.5.5. Parallax. – Parallax effects shall be reduced to the practical minimum.

S.1.6. Additional Operating Requirements, Retail Devices (Except Slow-flow Meters).

- **A slow-flow meter is a retail device designed for the measurement, at very slow rates (less than 40 L (10 gal) per hour.**

S.1.6.1. Indication of Delivery. – The device shall automatically show on its face the initial zero condition and the quantity delivered (up to the nominal capacity). However, the following requirements shall apply:

For electronic devices manufactured prior to January 1, 2006, the first 0.03 L (or 0.009 gal) of a delivery and its associated total sales price need not be indicated.

For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.
[Nonretroactive as of January 1, 2006]

S.1.6.2. Provisions for Power Loss.

S.1.6.2.1. Transaction Information. *– In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.*
[Nonretroactive as of January 1, 1983]

S.1.6.2.2. User Information. *– The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.*
[Nonretroactive as of January 1, 1983]

S.1.6.3. Return to Zero.

(a) The primary indicating elements, and primary recording elements if the device is equipped to record, shall be readily returnable to a definite zero indication. However, a key-lock operated or other self-operated device may be equipped with cumulative indicating or recording elements, provided that it is also equipped with a zero-return indicating element.

(b) It shall not be possible to return primary indicating elements, or primary recording elements beyond the correct zero position.

(c) Primary indicating elements shall not be resettable to zero during a delivery.

S.1.6.4. Display of Unit Price and Product Identity.

S.1.6.4.1. Unit Price.

(a) A computing or money-operated device shall be able to display on each face the unit price at which the device is set to compute or to dispense.

(b) Except for dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), whenever a grade, brand, blend, or mixture is offered for sale from a device at more than one unit price, then all of the unit prices at which that product is offered for sale shall meet the following conditions:

(1) For a system that applies a discount prior to the delivery, all unit prices shall be displayed or shall be capable of being displayed on the dispenser through a deliberate action of the customer prior to the delivery of the product. It is not necessary that all of the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed prior to the delivery of the product.
[Nonretroactive as of January 1, 1991]

(2) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (b)(1), provided the system complies with S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.
(Added 2012)

NOTE: When a product is offered at more than one unit price, display of the unit price information may be through the deliberate action of the customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.

S.1.6.4.2. Product Identity.

(a) A device shall be able to conspicuously display on each side the identity of the product being dispensed.

(b) A device designed to dispense more than one grade, brand, blend, or mixture of product also shall be able to display on each side the identity of the grade, brand, blend, or mixture being dispensed.

- **The requirement states, "shall be able to conspicuously display…," however, that is for the design of the RMFD. When in service it must display the information in (a) and (b). See UR.3.2 Unit Price and Product Identity in the User Requirements section of H-44.**

S.1.6.5. Money-Value Computations.

(a) A computing device shall compute the total sales price at any single-purchase unit price (i.e., excluding fleet sales, other price contract sales, and truck stop dispensers used only to refuel trucks) for which the product being measured is offered for sale at any delivery possible within either the measurement range of the device or the range of the computing elements, whichever is less.
[Nonretroactive as of January 1, 1991]

(b) The analog sales price indicated for any delivered quantity shall not differ from a mathematically computed price (quantity × unit price = total sales price) by an amount greater than the value in Table 1. Money-Value Divisions and Maximum Allowable Variations for Money-Value Computations on Mechanical Analog Computers.

S.1.6.5.1. Money-Value Divisions, Analog. – The values of the graduated intervals representing money values on a computing type device shall be no greater than those in Table 1. Money-Value Divisions and Maximum Allowable Variations for Money-Value Computations on Mechanical Analog Computers.

Table 1.
Money-Value Divisions and
Maximum Allowable Variations for Money-Value
Computations on Mechanical Analog Computers

Unit Price		Money-Value Division	Maximum Allowable Variation	
From	To and Including		Design Test	Field Test
0	\$0.25/liter or \$1.00/gallon	1¢	± 1¢	± 1¢
\$0.25/liter or \$1.00/gallon	\$0.75/liter or \$3.00/gallon	1¢ or 2¢	± 1¢	± 2¢
\$0.75/liter or \$3.00/gallon	\$2.50/liter or \$10.00/gallon	1¢ or 2¢	± 1¢	± 2¢
		5¢	± 2½¢	± 5¢

S.1.6.5.2. Money-Value Divisions, Digital. – A computing type device with digital indications shall comply with the requirements of paragraph G.S.5.5. Money-Values, Mathematical Agreement, and the total price computation shall be based on quantities not exceeding 0.05 L for devices indicating in metric units and 0.01 gal intervals for devices indicating in U.S. customary units.

G-S.5.5. Money Values, Mathematical Agreement is as follows:

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."

S.1.6.5.3. Auxiliary Elements. *– If a system is equipped with auxiliary indications, all indicated money-value divisions of the auxiliary element shall be identical with those of the primary element.*
[Nonretroactive as of January 1, 1985]

S.1.6.5.4. Selection of Unit Price. – A system shall not permit a change to the unit price during delivery of product. When a product or grade is offered for sale at more than one unit price through a computing device, the following conditions shall be met:

(a) Except for a system only capable of applying a post-delivery discount(s), the selection of the unit price shall be made prior to delivery through a deliberate action of the customer to select the unit price for the fuel delivery.
[Nonretroactive as of January 1, 1991]

(b) For a system only capable of applying a post-delivery discount(s), the selection of the unit price shall be made through a deliberate action of the customer to select the unit price for the fuel delivery.

Note: When a product is offered at more than one unit price, selection of the unit price may be through the deliberate action of the customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer**.**

The provisions in (a) and (b) do not apply to dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks).

(Added 1989) (Amended 1991, 1992, 1993, 1996, and 2012)

S.1.6.5.5. Display of Quantity and Total Price. *– Except for aviation refueling applications, when a delivery is completed, the total price and quantity for that transaction shall be displayed on the face of the dispenser for at least five minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.*
[Nonretroactive as of January 1, 1994]

- **Verify after delivery is completed, that the quantity and total price are displayed for at least 5 minutes or until the next transaction is initiated by the customer. A stopwatch is to be used during this test.**

S.1.6.5.6. Display of Quantity and Total Price, Aviation Refueling Applications.

(a) The quantity shall be displayed throughout the transaction.

(b) The total price shall also be displayed under one of the following conditions:

(1) The total price can appear on the face of the dispenser or through a controller adjacent to the device.

(2) If a device is designed to continuously compute and display the total price, then the total price shall be computed and displayed throughout the transaction for the quantity delivered.

(c) The total price and quantity shall be displayed for at least five minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.

(d) A printed receipt shall be available and shall include, at a minimum, the total price, quantity, and unit price.

[Nonretroactive as of January 1, 2008]

S.1.6.6. Agreement Between Indications.

(a) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a retail motor fuel dispenser, the value may differ from the quantity value displayed on the dispenser, provided the following conditions are met:

(1) all total money-values for an individual sale that are indicated or recorded by the system agree; and

(2) *within each element, the values indicated or recorded meet the formula (quantity × unit price = total sales price) to the closest cent.*
[Nonretroactive as of January 1, 1988]

(b) When a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the following conditions shall apply for computed values:

(1) the total volume of the delivery shall be in agreement between all elements in the system.

S.1.6.7. Recorded Representations. *– Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a printed receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:*

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity by name, symbol, abbreviation, or code number.
[Nonretroactive as of January 1, 1986]

S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

(a) the product identity by name, symbol, abbreviation, or code number;

(b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

(c) an itemization of the post-delivery discounts to the unit price; and

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

S.1.6.10. Automatic Timeout – Pay-At-Pump for Retail Devices. *– Once a device has been authorized, it must deauthorize within two minutes if not activated. Reauthorization of the device must be performed before any product can be dispensed. If the time limit to deauthorize the device is programmable, it shall not accept an entry greater than two minutes.*
[Nonretroactive as of January 1, 2017]

S.2. Measuring Elements.

S.2.1. Air/Vapor Elimination. – A measuring system shall be equipped with an effective air/vapor eliminator or other automatic means to prevent the passage of air/vapor through the meter. Vent lines from the air/vapor eliminator shall be made of appropriate non-collapsible material.

Table S.2.2. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods 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 or shall not operate while in this mode.*	*[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]** *[*Nonretroactive as of January 1, 1996]*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.* *[Nonretroactive as of January 1, 2001]*	*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 on demand through the device or through another on-site device. The information may also be 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.)*

[Nonretroactive as of January 1, 1995]

S.2.2. Provision for Sealing. – For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Devices.

Refer to NTEP CC for information regarding sealing of the device being inspected.

G-S.8.2. is as follows: 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:

(1) an event logger in the device; or

(2) 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.

(Added 2019) **End of G-S.8.2.**

For parameters adjusted using other means, the following applies.

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

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

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

*Audit trails shall use the format set forth in Table S.2.2.**

*[*Nonretroactive as of January 1, 1995]*

S.2.3. Directional Flow Valves. – Valves intended to prevent reversal of flow shall be automatic in operation.

S.2.4. Stop Mechanism.

S.2.4.1. Indication. – The delivery for which the device is set shall be conspicuously indicated.

S.2.4.3. Setting. – If two or more stops or other elements may be selectively brought into operation to permit predetermined quantities of deliveries:

(a) the position for the proper setting of each such element shall be accurately defined; and

(b) any inadvertent displacement from the proper setting shall be obstructed.

S.2.5. Zero-Set-Back Interlock for Retail Devices. – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;

(b) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating elements on that dispenser are in a correct zero position.

S.3. Discharge Lines and Valves.

S.3.1. Diversion of Measured Liquid. – No means shall be provided by which any measured liquid can be diverted from the measuring chamber of the meter or its discharge line.

Two or more delivery outlets may be installed only if automatic means are provided to ensure that:

(a) liquid can flow from only one outlet at a time; and

(b) the direction of flow for which the mechanism may be set at any time is clearly and conspicuously indicated.

An outlet that may be opened for purging or draining the measuring system or for recirculating, if recirculation is required in order to maintain the product in a deliverable state, shall be permitted only when the system is measuring food products, agri-chemicals, biodiesel, or biodiesel blends. Effective automatic means shall be provided to prevent passage of liquid through any such outlet during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the outlet is in operation.

S.3.2. Exceptions. – The provisions of S.3.1. Diversion of Measured Liquid shall not apply to truck refueling devices when diversion of flow to other than the receiving vehicle cannot readily be accomplished and is readily apparent. Allowable deterrents include, but are not limited to, physical barriers to adjacent driveways, visible valves, or lighting systems that indicate which outlets are in operation, and explanatory signs.

S.3.3. Pump-Discharge Unit. – A pump-discharge unit equipped with a flexible discharge hose shall be of the wet-hose type.

NOTE: Wet-hose type is defined as: A type of device designed to be operated with the discharge hose full of product at all times. (Also see "wet hose.") [3.30, 3.32, 3.34, 3.37, 3.38, 3.39]

S.3.4. Gravity-Discharge Unit. – On a gravity-discharge unit:

(a) the discharge hose or equivalent pipe shall be of the dry-hose type with no shutoff valve at its outlet end unless the hose or pipe drains to the same level under all conditions of use;

(b) the dry-hose shall be sufficiently stiff and only as long as necessary to facilitate drainage;

(c) an automatic vacuum breaker, or equivalent mechanism, shall be incorporated to prevent siphoning and to ensure rapid and complete drainage; and

(d) the inlet end of the hose or outlet pipe shall be high enough to ensure complete drainage.

S.3.5. Discharge Hose, Reinforcement. – A discharge hose shall be reinforced so that the performance of the device is not affected by the expansion or contraction of the hose.

S.3.6. Discharge Valve. – A discharge valve may be installed in the discharge line only if the device is of the wet-hose type. Any other shutoff valve on the discharge side of the meter shall be of the automatic or semiautomatic predetermined-stop type or shall be operable only:

(a) by means of a tool (but not a pin) entirely separate from the device; or

(b) by mutilation of a security seal with which the valve is sealed open.

S.3.7. Anti-drain Means. – In a wet-hose pressure-type device, means shall be incorporated to prevent the drainage of the discharge hose.

- **Conduct an anti-drain valve test by placing the RMFD in the off position and raising the hose three feet above the nozzle. With the nozzle positioned above the test measure or prover, depress the trigger and observe the flow. It is normal for some product to flow and then step. This is acceptable, however continuous flow is unacceptable.**

S.4. Marking Requirements.

S.4.1. Limitation on Use. – The limitations on its use shall be clearly and permanently marked on any device intended to measure accurately only:

(a) products having particular properties;

(b) under specific installation or operating conditions; or

(c) when used in conjunction with specific accessory equipment.

S.4.2. Air Pressure. – If a device is operated by air pressure, the air pressure gauge shall show by special graduations or other means the maximum and minimum working pressures recommended by the manufacturer.

S.4.4. Retail Devices.

S.4.4.1. Discharge Rates. *– On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked in accordance with S.4.4.2. Location of Marking Information; Retail Dispensers. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
[Nonretroactive as of January 1, 1985]

Example: With a marked maximum discharge rate of 230 L/min (60 gpm), the marked minimum discharge rate shall be 45 L/min (12 gpm) or less (e.g., 40 L/min [10 gpm] is

acceptable). A marked minimum discharge rate greater than 45 L/min (12 gpm) (e.g., 60 L/min [15 gpm]) is not acceptable.

S.4.4.2. Location of Marking Information for Retail Dispensers. *– The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

(a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser (for a system in a dispenser);

(b) either internally and/or externally provided the information is permanent and easily read; and

(c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices.
[Nonretroactive as of January 1, 2003]

S.5. Totalizers for Retail Dispensers. – *Retail dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device.*
[Nonretroactive as of January 1, 1995]

N. Notes

PRETEST: If the test measure or prover is dry, product must be metered into it to wet it prior to testing the RMFD. This step must be repeated whenever a period of time has elapsed and may have resulted in the test measure or prover drying.

- **The test measure or prover must be level when reading the indications to ensure accurate results.**

- **Check for the presence of security seals on the meter. Document if security seals are missing or broken and replace after completing the inspection and test.**

N.1. Test Liquid.

N.1.1. Type of Liquid. – The liquid used for testing a liquid-measuring device shall be the type the device is used to measure, or another liquid with the same general physical characteristics.

- **The performance of a meter may be adversely affected by the properties of the liquid, e.g., viscosity, lubricity, specific gravity, etc. Test the RFMD with the product intended to be sold or with approved products of similar characteristics.**

N.2. Volume Change. – Care shall be taken to minimize changes in volume of the test liquid due to temperature changes and evaporation losses.

NOTE: Care must always be taken to avoid changes in the volume of test liquid due to evaporation losses, but it is most likely to occur in warmer climates or seasons. Quickly taking a reading or using vapor recovery equipment will minimize errors due to vapor loss.

N.3. Test Drafts.

N.3.1. Retail Piston-Type and Visible-Type Devices. – Test drafts shall include the full capacity delivery and each intermediate delivery for which the device is designed.

N.3.4. Other Retail Devices. – On devices with a designed maximum discharge rate of:

(a) less than 80 L (20 gal) per minute, tests shall include drafts of one or more amounts, including a draft of at least 19 L (5 gal).

(b) 80 L (20 gal) per minute or greater, tests shall include drafts of one or more amounts, including a draft of at least the amount delivered by the device in one minute at the maximum flow rate of the installation.

(Amended 1984)

N.4. Testing Procedures.

N.4.1. Normal Tests. – The "normal" test of a device shall be made at the maximum discharge flow rate developed under the conditions of installation. Any additional tests conducted at flow rates down to and including one-half of the sum of the maximum discharge flow rate and the rated minimum discharge flow rate shall be considered normal tests.

N.4.2. Special Tests. – "Special" tests shall be made to develop the operating characteristics of a device and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. Normal Tests shall be considered a special test.

N.4.2.2. Retail Motor-Fuel Devices and DEF Devices

(a) Devices without a marked minimum flow-rate shall have a "special" test performed at the slower of the following rates:

(1) 19 L (5 gal) per minute; or

(2) the minimum discharge rate at which the device will deliver when equipped with an automatic discharge nozzle set at its slowest setting.

(b) Devices with a marked minimum flow-rate shall have a "special" test performed at or near the marked minimum flow rate.

(Added 1984) (Amended 2005 and 2019)

- **A "special" test is required for RMFD. How the test is performed depends on whether the minimum flow rate is marked on the meter. Test at minimum flow rate if marked and at lowest nozzle setting if not marked.**

N.4.3. Money-Value Computation Tests.

N.4.3.2. Field Tests. – In the conduct of field tests to determine compliance with paragraph S.1.6.5. Money-Value Computations, the maximum allowable variation in the indicated sales price shall be as shown in Table 1. Money-Value Divisions and Maximum Allowable Variations for Money-Value Computations on Mechanical Analog Computers.

(Added 1982) (Amended 1984)

N.4.4. Pour and Drain Times.

- **Adhere to pour and drain times because test measures and provers (larger test measures) are calibrated and certified "*wet.*"**

N.4.4.1. Pour and Drain Times for Hand-held Test Measures. – Hand-held test measures require a 30-second (± 5 seconds) pour followed by a 10-second drain with the measure held at a 10-degree to 15-degree angle from vertical.

N.4.4.2. Drain Times for Bottom Drain Test Measures or Provers. – Bottom drain field standard provers require a 30-second drain time after main flow cessation.

- **Use a stopwatch to determine the 30-second drain time.**

N.4.5. Verification of Linearization Factors. – All enabled linearization factors shall be verified. The verification of enabled linearization factors shall be done through physical

testing, or a combination of physical testing and empirical analysis at the discretion of the official with statutory authority.

(Added 2016)

N.4.6. Repeatability Tests. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained. When conducting the tests, the flow rates shall be within the minimum and maximum discharge rates as marked by the manufacturer. For devices with no marked minimum and maximum flow rates, the minimum discharge rates shall be as specified in N.4.2.1. or N.4.2.2. and the maximum discharge rates shall be the maximum discharge rate developed under the conditions of the installation. For devices equipped with an automatic temperature compensator, the results shall be based on the uncompensated (gross) volume (e.g., with the temperature compensator deactivated).

(Renumbered and Amended 2019)

- **N.4.6. states "Tests for repeatability *should* include a minimum of three consecutive test drafts…" It is not mandatory to conduct repeatability tests but is highly recommended.**

- **Repeatability tests should be conducted whenever the results of a test are at or near tolerance limits. The test should be repeated at a minimum of one time, however the Repeatability Tests as outlined in N.4.6. should be followed if the initial results exceed tolerance limits.**

T. Tolerances

T.1. Application to Underregistration and to Overregistration. – The tolerances hereinafter prescribed shall be applied to errors of underregistration and errors of overregistration, whether or not a device is equipped with an automatic temperature compensator.

Table T.2.
Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30.

Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance[1]
0.3	- Petroleum products delivered from large capacity (flow rates greater than 115 L/min or 30 gpm)** devices, including motor-fuel devices - Heated products (other than asphalt) at temperatures greater than 50 °C (122 °F) - Asphalt at temperatures equal to or below 50 °C (122 °F) - All other liquids not shown in the table where the typical delivery is over 200 L (50 gal)	0.2 %	0.3 %	0.5 %
0.3A	- Asphalt at temperatures greater than 50 °C (122 °F)	0.3 %	0.3 %	0.5 %
0.5*	- Petroleum products delivered from small capacity (at 4 L/min (1 gpm) through 115 L/min or 30 gpm)** motor-fuel devices - Agri-chemical liquids - All other applications not shown in the table where the typical delivery is ≤ 200 L (50 gal)	0.3 %	0.5 %	0.5 %
1.1	- Petroleum products and other normal liquids from devices with flow rates** less than 1 gpm. - Devices designed to deliver less than 1 gal	0.75 %	1.0 %	1.25 %

* For test drafts ≤ 40 L or 10 gal, the tolerances specified for Accuracy Class 0.5 in the table above do not apply. For these test drafts, the following applies:

(a) Maintenance tolerances on normal and special tests shall be 20 mL plus 4 mL per indicated liter or 1 in^3 plus 1 in^3 per indicated gallon.

(b) Acceptance tolerances on normal and special tests shall be one-half the maintenance tolerance values.

[1] Special test tolerances are not applicable to retail motor fuel dispensers.

** Flow rate refers to designed or marked maximum flow rate.

T.2. Tolerance Values. – Maintenance, acceptance, and special test tolerances shall be as shown in Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30.

- **Table T.2. states tolerances for LMDs, however, the tolerances for RMFD are in the footnote of Table T.2. (not the Table) and are as follows:**

For test drafts ≤ 40 L or 10 gal, the tolerances specified for Accuracy Class 0.5 in the table above do not apply. For these test drafts, the following applies:

(a) Maintenance tolerances on normal and special tests shall be 20 mL plus 4 mL per indicated liter or 1 in^3 plus 1 in^3 per indicated gallon.

(b) Acceptance tolerances on normal and special tests shall be one-half the maintenance tolerance values.

- **The maintenance tolerance when using a 5- or 10-gallon test measure to test an RMFD is 1 in^3 plus 1 in^3 per indicated gallon or 6 in^3 for a 5-gallon test measure and 11 in^3 for a 10-gallon test measure. Acceptance is one-half or 3 in^3 for a 5-gallon test measures and 5 in^3 for a10-gallon test measure.**

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. This tolerance does not apply to the test of the automatic temperature-compensating system. (Also see N.4.6. Repeatability Tests.)

UR. User Requirements.

UR.1. Selection Requirements.

UR.1.1. Discharge Hose.

UR.1.1.1. Length. – The length of the discharge hose on a retail motor-fuel device:

(a) shall be measured from its housing or outlet of the discharge line to the inlet of the discharge nozzle;

(b) shall be measured with the hose fully extended if it is coiled or otherwise retained or connected inside a housing; and

(c) shall not exceed 5.5 m (18 ft) unless it can be demonstrated that a longer hose is essential to permit deliveries to be made to receiving vehicles or vessels.

An unnecessarily remote location of a device shall not be accepted as justification for an abnormally long hose.

UR.1.1.2. Marinas and Airports.

UR.1.1.2.1. Length. – The length of the discharge hose shall be as short as practicable and shall not exceed 15 m (50 ft) unless it can be demonstrated that a longer hose is essential.

UR.1.1.2.2. Protection. – Discharge hoses exceeding 8 m (26 ft) in length shall be adequately protected from weather and other environmental factors when not in use.

(Made retroactive 1974 and Amended 1984)

UR.2. Installation Requirements.

UR.2.1. Manufacturer's Instructions. – A device shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.

UR.2.2. Discharge Rate. – A device shall be installed so that the actual maximum discharge rate will not exceed the rated maximum discharge rate. Automatic means for flow regulation shall be incorporated in the installation if necessary.

UR.2.3. Suction Head. – A piston-type device shall be installed so that the total effective suction head will not be great enough to cause vaporization of the liquid being dispensed under the highest temperature and lowest barometric pressure likely to occur.

UR.2.4. Diversion of Liquid Flow. – A device equipped with two delivery outlets used exclusively in the fueling of trucks shall be so installed that any diversion of flow to other than the receiving vehicle cannot be readily accomplished and is readily apparent. Allowable deterrents include, but are not limited to, physical barriers to adjacent driveways, visible valves, or lighting systems that indicate which outlets are in operation, and explanatory signs.

UR.2.5. Product Storage Identification.

(a) The fill connection for any petroleum product or other product storage tank or vessel supplying petroleum product or other products shall be permanently, plainly, and visibly marked as to product contained.

(b) When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

UR.3. Use of Device.

UR.3.1. Return of Indicating and Recording Elements to Zero. – On any dispenser used in making retail deliveries, the primary indicating element, and recording element if so equipped, shall be returned to zero before each delivery.

Exceptions to this requirement are totalizers on key-lock-operated or other self-operated dispensers and the primary recording element if the device is equipped to record.

UR.3.2. Unit Price and Product Identity.

(a) The following information shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale:

(1) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and

(2) in the case of a computing type or money-operated type, the unit price at which the dispenser is set to compute.

Provided that the dispenser complies with S.1.6.4.1. Display of Unit Price, it is not necessary that all the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed or posted.

(b) The following information shall be conspicuously displayed or posted on each side of a retail dispenser used in direct sale:

(1) the identity of the product in descriptive commercial terms; and

(2) the identity of the grade, brand, blend, or mixture that a multi-product dispenser is set to deliver.

(Amended 1972, 1983, 1987, 1989, 1992, 1993, and 2012)

UR.3.3. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.

(Became retroactive 1999)

The following exceptions apply:

(a) Fleet sales and other price contract sales are exempt from this requirement.

(b) A truck stop dispenser used exclusively for refueling trucks is exempt from this requirement provided that:

(1) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per gallon, the total gallons delivered, and the total price of the sale; and

(2) unless a dispenser complies with S.1.6.4.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.

(c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:

(1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute prior to the application of any discount shall be the highest unit price for any transaction;

(2) all purchases of fuel are accompanied by a receipt recorded by the system. The receipt shall contain:

a. the product identity by name, symbol, abbreviation, or code number;

b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:

1. total volume of the delivery;

2. unit price; and

3. total computed price of the fuel sale prior to post-delivery discounts being applied.

c. an itemization of the post-delivery discounts to the unit price; and

d. the final total price of the fuel sale.

UR.3.4. Printed Ticket. – The total price; the total volume of the delivery; the price per liter or gallon; *and a corresponding alpha or numeric dispenser designation** shall be shown, either printed by the device or in clear hand script, on any printed ticket issued by a device and containing any one of these values. Establishments where no product grades are repeated are exempt from the dispenser designation requirement.
**[Nonretroactive as of January 1, 2021]*

UR.3.5. Steps after Dispensing. – After delivery to a customer from a retail motor-fuel device:

(a) the starting lever shall be returned to its shutoff position and the zero-set-back interlock engaged; and

(b) the discharge nozzle shall be returned to its designed hanging position unless the primary indicating elements, and recording elements, if the device is equipped and activated to record, have been returned to a definite zero indication.

U.R.4. Maintenance Requirements.

U.R.4.1. Use of Adjustments. – Whenever a device is adjusted, all enabled linearization factors shall be verified to determine that the errors are in tolerance and any adjustments which are made shall be made so as to bring performance errors as close as practicable to zero value. The verification of enabled linearization factors shall be done through physical testing or a combination of testing and empirical analysis.

REVELANT SECTIONS OF NIST H-130 – APPENDIX A

The relevant sections of NIST H-130 have been reproduced in Appendix A. They are provided to include fuel quality requirements and important information regarding labeling, octane rating, nozzle, and filter size, etc. The inspector should familiarize themselves with these requirements along with the specific fuel quality laws of their jurisdiction before conducting an inspection of a RMFD.

Requirements not related to motor-fuel have been deleted.

2020 Examination Procedure Outline

Retail Motor-Fuel Dispensers Single, Dual, and Multi-Product (Except Blenders)

It is recommended that this outline be followed as minimum criteria for examining conventional, single and dual product, power-operated retail dispensers --"gasoline pumps," analog or digital, and consoles.

This outline may also be used for multi-product dispensers that share a single hose and those that dispense blended products. However, “blender pumps” require normal and special tests at the highest, middle and lowest grades.

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.
- Obtain and read copies of MSDS’s.
- Know the emergency procedures and location and operation of fire extinguishers and emergency shut- offs.
- Post safety cones/warning signs and be aware of vehicular and pedestrian traffic patterns.
- Use caution when moving in wet, slippery areas.
- Open both sides of the dispenser to allow fumes to dissipate before proceeding with the inspection.
- If leaks, spills, or exposed wiring cause hazardous testing conditions, it is recommended that the testing be discontinued until the unsafe conditions are corrected.
- 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 gas pump is traceable to an NTEP CC, if applicable. It is suitable for its application and has been installed correctly.

It is recommended that, except under certain conditions, e.g., consumer complaint investigation, that the device 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.**

- **A copy of NIST H-44 adopted by the state or jurisdiction. Requirements contained in later editions of H-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.**
  - **Test equipment includes, but is not limited to:**
    - **Properly maintained and calibrated test measures or provers**
    - **Equipment to return product to storage**
    - **Stopwatch**
    - **Flashlight**
    - **Mirror with extension**

FIRST STEPS

- **Identify yourself to the manager and show official identification.**
- **Explain the purpose of your visit.**
- **Verify meter licenses are current (if applicable).**
- **Ask if the manager has a preference on where you will begin your inspection.**
- **Position vehicle and test equipment near the first dispenser and place safety equipment before beginning.**

INITIAL INSPECTION

- **Perform visual inspection of signage and condition of the site.**
- **Open cabinet and inspect for leaks or seepage on hoses and breakaways.**
- **Inspect security seals.**
- **Refer to NIST Handbook 130, Uniform Fuels and Automotive Lubricants Regulation section 3.1.4 for Gasoline and Gasoline-Oxygenate Blends**
  Nozzle Requirements
  Retail Dispenser
  Labeling
  Minimum Antiknock Index
  Requirements Method of Retail Sale
  EPA Labeling Requirements
  Biodiesel and Biodiesel Blends
  Requirements Diesel Exhaust Fluid
  Requirements
  Retail Storage Tanks and Dispenser
  Filters Other related information

SUITABLITY OF TEST EQUIPMENT

- **Determine capacity of the test measure to be used, 5-gallon or -10 gallon based on the maximum flow for one minute.**
- **Examine the test measure or prover to ensure it is not damaged (dents will change its volume and it must not be used unless calibrated and certified in that condition).**
- **Examine the inside of the test measure or prover to ensure it is clean.**

- **Ensure that its calibration seal is affixed to the scale and do not use if it is broken. Have it re-calibrated and certified.**

PREPARATION OF TEST MEASURE

- **Wet the test measure or prover and follow proper drain procedures.**
- **Level the test measure and recheck level after filling.**

FUEL QUALITY SAMPLING

- **Sample fuel as prescribed by your jurisdiction.**

CONDUCT OF TEST

- **Locate storage and ensure it is appropriately marked.**
- **Insert the nozzle into the test measure or prover and properly ground it against the neck.**
- **Dispense product normally in a manner replicating actual use (normal test).**
- **Stop when the dispenser indicates exactly the volume of the test measure or prover you are using, e.g., 5-gallon or 10-gallon. It is often challenging to stop the flow exactly on the exact volume of the test measure or prover so the volume of the test measure or prover for the purposes of applying the tolerance must be adjusted.**
- **Conduct a slow flow (special) test to determine the performance of the meter at lower flow rates which can affect meter performance.**
- **Blender dispensers require additional normal and special tests. Conduct normal and special at the highest, middle and lowest grades. NOTE: Return any blended product to the storage tank containing the lowest octane fuel.**
- **Repeat the tests if the meter is at, near or exceeds the allowable tolerance to ensure the prior test was conducted correctly and accurately represents the meter's performance.**
- **The test measure or prover must be drained properly after each test draft.**
    - **Drain the test measure or prover so that flow stops after 30 seconds and then continue to drain for 10 seconds.**
- **Conduct an anti-drain valve test by placing the RMFD in the off position and raising the hose three feet above the nozzle. With the nozzle positioned above the test measure or prover, depress the trigger and observe the flow. It is normal for some product to flow and then step. This is acceptable, however continuous flow is unacceptable.**

H-44 Section	Code References	Notes and Additional Information
Selection and Suitability	G-S.3., G-UR.1.1.,G-UR.1.2. G-UR.1.3., UR.3.3.	

Installation	G-S.2., G-UR.2.1.,G-UR.2.2.,	

	UR.2.1., UR.2.2.,UR.2.4.	
Position of Equipment	G-UR.3.3.	
Accessibility	G-UR.2.3.	
Assistance	G-UR.4.4.	
Use and Maintenance	G-UR.3.1., G-UR.4.1., G-UR.4.2., UR.3.5.	
Computing Capability	UR.3.3.	
Design	S.1.1.	
Units	S.1.2.1., S.1.2.3.(a), S.1.2.3.(c)	
Readability	G-S.5., G-S.6. (1/1/77), G-S.7., S.1.4., S.1.5.	
Values of Intervals	G-S.5.3., G-S.5.3.1.	
Indication of delivery	S.1.6.1. (portions NR 1/1/06)	
Money-value divisions - Analog	S.1.6.5.1.	
Money-value divisions - Digital	S.1.6.5.2.	

Auxiliary indications	S.1.6.5.3. (1/1/85)	

Unit Price and product identity	S.1.6.4.1.(a), S.1.6.4.2., UR.3.2., UR.3.3.	
Multiple unit price dispensers	S.1.6.4.1.(b)(1/1/91), S.1.6.4.1. (b)(2), S.1.6.5.(a) (1/1/91), S.1.6.5.4.(a) (1/1/91), S.1.6.5.4.(b), UR.3.3.	
Quantity and total price display – except aviation refueling	S.1.6.5.5. (1/1/94)	
Quantity and total price display – aviation refueling	S.1.6.5.6. (1/1/08)	
Advancement and return to zero	S.1.3., S.1.6.3., UR.3.1.	Check both sides of analog devices for start and return to zero.
Recorded representations. General	G-S.5.6.	
Recorded representations. Point of sale systems	S.1.6.7. (1/1/86)	
Post-delivery discounts	S.1.6.8., UR.3.3.	
Provision for sealing	G-S.8. (1/1/90), G-UR.4.5., S.2.2.,	

	Table S.2.2. (1/1/95)	
Provision for sealing multiple measuring elements with a common provision for sealing	G-S.8.1. (1/1/10)	
Marking	G-S.1., G-S.1.1. (1/1/04), G-S.1.2. (1/1/02), G-UR.2.1.1., G-UR.3.4., S.4.1., S.4.4.1. (1/1/85), S.4.4.2. (1/1/03)	
Discharge hose-retail Length – General Length and Protection – Marinas and Airports	S.3.1. , S.3.2., S.3.3., S.3.5., S.3.6., S.3.7. UR.1.1.1. UR.1.1.2.	
Totalizers	S.5. (1/1/95)	
Pretest Determinations Test Liquid N.1.1. Verify that the liquid available for testing is appropriate. The liquid is appropriate if it is the same product normally dispensed or has the same or similar property characteristics and has been approved for that device.		
Security Means	G-UR.4.5., S.2.2.	

Check for the presence of security seals on the device. Document missing seals on the official report and apply new ones as needed after testing. Checking for security seals should be done before initiating the test as it may be a simple oversight or could indicate tampering. If tampering is suspected, then it may be prudent not to test and discuss how to proceed with your supervisor.		
Tolerances Applicable requirements	G-T., T.1.	Follow your jurisdiction's policies for "rejecting" or "condemning" devices when found out of tolerance.
The maintenance tolerance when using a 5- or 10-gallon test measure to test an RMFD is 1 in^3 plus 1 in^3 per indicated gallon or 6 in^3 for a 5-gallon test measure and 11 in^3 for a 10-gallon test measure. Acceptance is one-half or 3 in^3 for a 5-gallon test measures and 5 in^3 for a 10-gallon test measure.		
Basic values	T.2., Table T.2	
Repeatability	T.3.	
Product storage identification	UR.2.5.	
Test Liquid Verify that the liquid available for testing is appropriate. The liquid is appropriate if it is the same product normally dispensed or has the same or similar property characteristics and has been approved for that device.	N.1.1.	
Test Draft Size	N3.4.	

Take care to minimize changes in volume of the test liquid due to temperature changes and evaporation losses.	N.2.	
Handheld test measures require a 30 s (+ 5 s) pour followed by a 10 s drain, with the measure held at a 10 to15 degree angle from vertical.	N.4.4.1.	
Bottom drain provers require a 30 s drain after the main flow ceases.	N.4.4.2.	
To determine proper operation of totalizers, read and record the totalizer indications before and after all test drafts.	S.5. (1/1/95)	
After each test draft: Print a ticket if the device is so equipped and verify required information is provided on the receipt.	G-S.5.6., G-S.5.6.1., UR.3.4.	
Verify that any options for obtaining a recorded representation are appropriate. The customer may be given the option of not receiving the recorded representation. If the system is equipped with the capability, the customer may also be given the option of receiving the recorded representation electronically in lieu of or in addition to a hard copy.	G-S.5.6.	
For transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash, verify that required information is printed on the receipt.	S.1.6.7. (1/1/86)	

Verify that required information is on the receipt and that a receipt is provided in applications where post-delivery discounts are offered.	S.1.6.8., UR.3.3.	
Check price computations on all indicators (including consoles) and on recorded representations.		
Digital equipment. Analog equipment.	G-S.5.5. S.1.6.5.(b), Table 1., N.4.3.2.	
Check for agreement of quantity values between indicated and recorded representations.	G-S.5.2.2., S.1.6.6.(a)(1) , S.1.6.6.(a)(2) (1/1/88), S.1.6.6.(b)	
Verify, after a delivery is completed, that the quantity and total price are displayed for at least five minutes or until the next transaction is initiated by a customer.	S.1.6.5.5 .(1/1/94), S.1.6.5.6 .(1/1/08) (aviation)	
	N.4.1., T.2., TableT.2	
For this and subsequent Normal Tests, verify that the maximum discharge rate of the installation does not exceed the marked maximum.	S.4.4.1. (1/1/85), UR.2.2.	
For this and subsequent tests, verify that other conditions of use do not exceed marked or manufacturer-specified limitations.	G-UR.3., S.4.1.	

At the beginning of the first delivery, check for suppressed values.	S.1.6.1. (1/1/06)	
For this and subsequent tests, re-check the level of the test measure or prover once it is full of liquid and before reading the indication to ensure that the weight of the product has not affected the level condition.		
If the result of the first test is at or near the tolerance limit, repeat this test. NOTE: While a repeatability test is not a mandated H-44 requirement it is highly recommended to conduct a repeatability test as outlined in Step 3 below during all inspections. This may vary depending on jurisdictions and the Weights and Measures Authority will determine policy for it.	N.4.1.2., T.3.	
Special – slow flow, basic tolerance. If the result of the first test is at or near the tolerance limit, repeat this test. If necessary, conduct a Repeatability Test as outlined in Step 3 below.	N.4.2., N.4.2.2., T.2., Table T.2N.4.1.2., T.3	
Repeatability Test. If necessary, conduct a repeatability test. A repeatability test must include at least three consecutive test drafts. Test drafts must be conducted under approximately the same conditions (e.g., flow rate and temperature) and be of approximately the same draft size.	N.2., N.3.4., N.4.1.2., T.3.	
RFI/EMI Test (electronic equipment only).	G-N.2., G-UR.1.2.,G-UR.3.2., G-UR.4.2.	

This testing is typically done only if a problem is suspected or during the inspection of a new installation. Radio Frequency Interference (RFI)Electromagnetic Interference (EMI)		
Anti-Drain Test - Check the effectiveness of the anti-drain means.	**S**.3.7.	
Zero-Setback Interlock - Check the effectiveness of the zero-setback interlock. On equipment with remote pumping systems, activate one dispenser and check all others operated by the same pump to make certain they will not operate without activating the individual starting levers.	S.2.5.	
Power Loss Test Before conducting a power loss test, first check with your supervisor to determine your jurisdiction's policy on the conditions under which this test is to be conducted.	S.1.6.2.1 .(1/1/83), S.1.6.2.2 .(1/1/83)	
Record the total quantity of product dispensed during testing on the official report.		
After all equipment at a location has been tested, review results to determine compliance with equipment maintenance and use of adjustments.	G-UR.4.1., G-UR.4.3.	Review and explain the inspection findings with the manager, obtain a signature and leave a copy of the report.

POST-INSPECTION CHECKLIST

INSPECTION TASK	YES ×	NO ×	COMMENTS
Reviewed H-44			
Reviewed NTEP CC			
Test Standard Inspected			
Inspection Report Fully Completed			
All Markings and Identification Correct			
Price Computation Correct			
RFMD(s) Correct			
RFMD(s) Incorrect			
All product returned to storage			
Starting and ending totalizers recorded			
Security seals affixed			
Inspection report presented to and signed by management			
Additional Comments:			

READING A MENISCUS

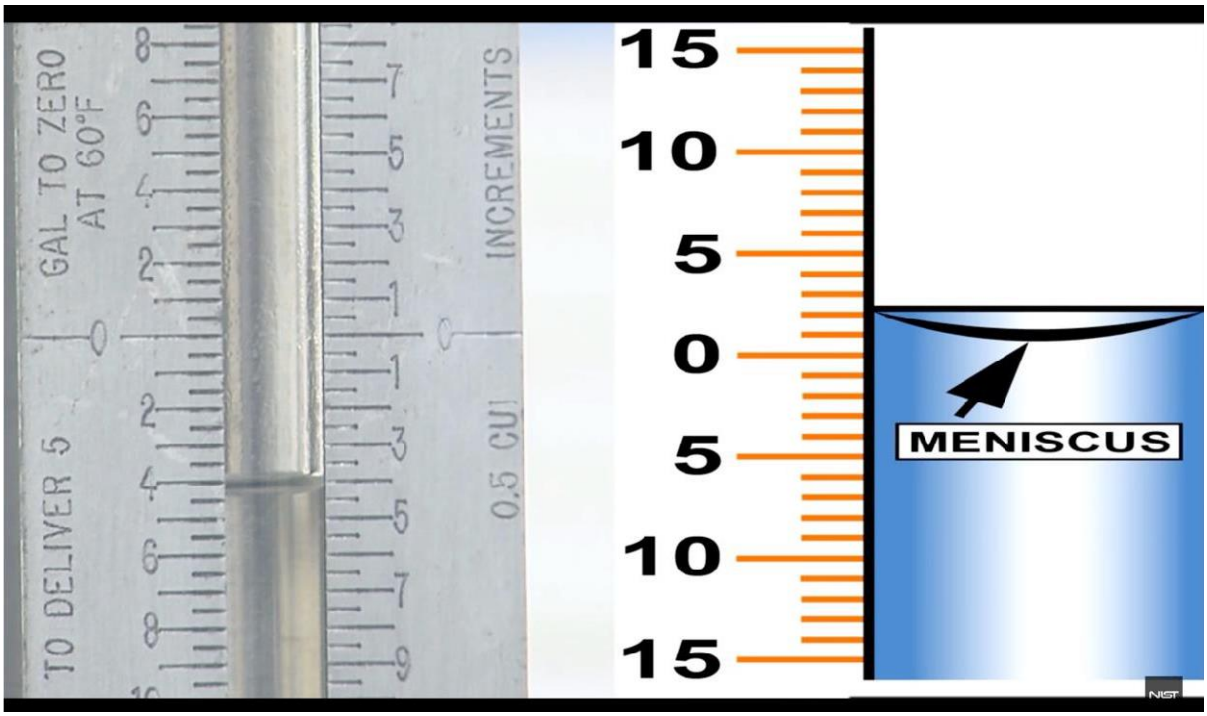
When you read the scale on your test measure or prover it's important that the measurement accounts for the meniscus.

For petroleum products, the bottom of the meniscus is read.

An accurate reading is achieved by looking up at the liquid level directly at eye level.

The bottom of meniscus may be directly on the zero graduation of the scale, but when it is not, you read the meniscus to the nearest graduation.

The meniscus is read to the nearest even graduation when it is equally between two graduations.



APPENDIX A HANDBOOK 130

UNIFORM FUELS AND AUTMOTIVE LUBRICANTS LAW
AND
UNIFORM FUELS AND AUTOMOTIVE LUBRICANTS REGULATION

C. Uniform Fuels and Automotive Lubricants Inspection Law

Section 1. Purpose

There should be uniform requirements for engine fuels, non-engine fuels, and automotive lubricants among the states. This Act provides for the establishment of quality specifications for these products.

(Amended 2008)

Section 2. Scope

The Act establishes a sampling, testing, and enforcement program, provides authority for fee collection, requires registration of engine fuels, and empowers the state to promulgate regulations as needed to carry out the provisions of the Act. It also provides for administrative, civil, and criminal penalties.

Section 3. Definitions

As used in this act:

3.1. Engine Fuel. – Any liquid or gaseous matter used for the generation of power in an internal combustion engine.

3.2. Director. – The_____of the Department of_____and designated agents.

3.3. Person. – An individual, corporation, company, society, association, partnership, or governmental entity.

3.4. ASTM International. (www.astm.org) – An international voluntary consensus standards organization formed for the development of standards on characteristics and performance of materials, products, systems, and services, and the promotion of related knowledge.

3.5. Automotive Lubricants. – Any material interposed between two surfaces that reduces the friction or wear between them.

3.6. Engine Fuel Designed for Special Use. – Engine fuels designated by the Director requiring registration. These fuels normally have no ASTM or other national consensus standards applying to their quality or usability; common special fuels are racing fuels and those intended for agricultural and other off-road applications.

3.7. Sold. – Kept, offered, or exposed for sale.

3.8. Non-engine Fuels. –Any liquid or gaseous matter used for the generation of heat, power, or similar uses.

(Added 2008)

Section 4. Administration, Adoption of Standards, and Rules

The provisions of this Act shall be administered by the Director. For the purpose of administering and giving effect to the provisions of this Act, the specification and test method standards set forth in the most recent version available of ASTM International standards as published on its website **www.astm.org** are adopted except as amended or modified as required by the Director to comply with federal and state laws. When no ASTM standard exists, other generally recognized national consensus standards may be used. The Director is empowered to write rules and regulations on the advertising, posting of prices, labeling, standards for, and identity of fuels, non-engine fuels, and automotive lubricants and is authorized to establish a testing laboratory.

(Amended 2008)

Section 5. General Duties and Powers

The Director shall have the authority to:

5.1. Enforce and administer all the provisions of this Act by inspections, analyses, and other appropriate actions.

5.2. Have access during normal business hours to all places where engine fuels, non-engine fuels, and automotive lubricants are kept, transferred, offered, exposed for sale, or sold for the purpose of examination, inspection, taking of samples, and review of fuel storage, receipts, transfers, sales records, or delivery records for determining compliance with this Act. If such access is refused by the owner, agent, or other persons leasing the same, the Director may obtain an administrative search warrant from a court of competent jurisdiction.

(Amended 2008)

5.3. Collect, or cause to be collected, samples of engine fuels, non-engine fuels, and automotive lubricants marketed in this state, and cause such samples to be tested or analyzed for compliance with the provisions of this Act.

(Amended 2008)

5.4. Define engine fuels for special use and refuse, revoke, suspend, or issue a stop-order if found not to be in compliance and remand stop-order if the engine fuel for special use is brought into full compliance with this Act.

5.5. Issue a stop-sale order for any engine fuel, non-engine fuels, and automotive lubricant found not to be in compliance and remand a stop-sale order if the engine fuel, petroleum product, or automotive lubricant is brought into full compliance with this Act.
(Amended 2008)

5.6. Refuse, revoke, or suspend the registration of an engine fuel, petroleum product, or automotive lubricant.

5.7. Delegate to appropriate personnel any of these responsibilities for the proper administration of this Act.

5.8. The Director is empowered to waive specific state requirements adopted under this Act or may establish alternative requirements for fuels as determined to be necessary in the event of an emergency or a natural disaster for a specified period of time.
(Added 2008)

Section 6. Registration of Engine Fuels Designed for Special Use

All engine fuels designed for special use must be registered with the Director. Such registration shall include:

6.1. Name, brand, or trademark under which the fuel will be sold.

6.2. Name and address of person registering the engine fuel.

6.3. The special use for which the engine fuel is designed.

6.4. A certification, declaration, or affidavit stating the fuel specifications.

Section 7. Inspection Fee

There shall be a fee of $_____per appropriate unit of measure on all products covered under the scope of this Act marketed within this state for the purposes of administering and effectively enforcing the provisions of this Act.

Section 8. Prohibited Acts

It shall be unlawful to:

8.1. Represent engine fuels, non-engine fuels, or automotive lubricants in any manner that may deceive or tend to deceive the purchaser as to the nature, brand, price, quantity, and/or quality of such products.

(Amended 1996 and 2008)

8.2. Fail to register an engine fuel designed for special use.

8.3. Submit incorrect, misleading, or false information regarding the registration of an engine fuel designed for special use.

8.4. Hinder or obstruct the Director in the performance of the Director's duties.

8.5. Represent an engine fuel, non-engine fuels, or automotive lubricant that is contrary to the provisions of this Act.

(Amended 2008)

8.6. Represent automotive lubricants with an S.A.E. (Society of Automotive Engineers) viscosity grade or API (American Petroleum Institute) service classification other than those specified by the intended purchaser.

(Added 1996)

Section 9. Civil Penalties

9.1. Assessment of Penalties. – Any person who, by himself or herself, by his or her servant or agent, or as the servant or agent of another person commits any of the acts enumerated in Section 8. Prohibited Acts may be assessed by the _____a civil penalty of:

(a) not less than $_____nor more than $_____for a first violation;

(b) not less than $_____ nor more than $_____ for a second violation within_____from the date of the first violation; and

(c) not less than $_____ nor more than $_____ for a third violation within_____from the date of the first violation.

9.2. Administrative Hearing. – Any person subject to a civil penalty shall have a right to request an administrative hearing within_____days of receipt of the notice of the penalty. The Director or his/her designee shall be authorized to conduct the hearing after giving appropriate notice to the respondent. The decision of the Director shall be subject to appropriate judicial review.

9.3. Collection of Penalties. – If the respondent has exhausted his or her administrative appeals and the civil penalty has been upheld, he or she shall pay the civil penalty within_____days after the effective date of the final decision. If the respondent fails to pay the penalty, a civil action

may be brought by the Director in any court of competent jurisdiction to recover the penalty. Any civil penalty collected under this Act shall be transmitted to_____.

Section 10. Criminal Penalties

10.1. Misdemeanor. – Any person who violates any provision of this Act or regulations promulgated thereto shall be guilty of a Class_____misdemeanor and upon conviction shall be punished by a fine of not less than $_____nor more than $_____, or imprisonment for not less than_____nor more than _____, or both.

10.2. Felony. – Any person who intentionally violates any provision of this Act or regulations promulgated thereto or is convicted under the misdemeanor provisions of this section more than three times in a two-year period shall be guilty of a Class _____ felony and upon conviction shall be punished by a fine of not less than $_____ nor more than $_____, or

imprisonment for not less than_____nor more than_____, or both.

Section 11. Restraining Order and Injunction

The Director is authorized to apply to any court of competent jurisdiction for a restraining order or a temporary or permanent injunction restraining any person from violating any provision of this Act.

Section 12. Severability Provisions

If any word, phrase, provision, or portion of this Act shall be held in a court of competent jurisdiction to be unconstitutional or invalid, the unconstitutionality or invalidity shall apply only to such word, phrase, provision, or portion, and for this purpose the provisions of this Act are declared to be severable.

Section 13. Repeal of Conflicting Laws

All laws and parts of laws contrary to or inconsistent with the provisions of this Act are repealed except as to offense committed, liabilities incurred, and claims made there under prior to the effective date of this Act.

Section 14. Citation

This Act may be cited as the "Fuels and Automotive Lubricants Inspection Act of_____." (Amended 2008)

Section 15. Effective Date

This Act shall become effective on_____.

G. Uniform Fuels and Automotive Lubricants Regulation

Section 1. Definitions

1.1. ASTM (ASTM International). (**www.astm.org**) – The international voluntary consensus standards organization formed for the development of standards on characteristics and performance of materials, products, systems, and services, and the promotion of related knowledge.

1.2. Antiknock Index (AKI). – The arithmetic average of the Research Octane Number (RON) and Motor Octane Number (MON): AKI = (RON+MON)/2. This value is called by a variety of names, in addition to antiknock index, including: octane rating, posted octane, (R+M)/2 octane.

1.4. Automotive Fuel Rating. – The automotive fuel rating required under the amended Automotive Fuel Ratings, Certification and Posting Rule (or as amended, the Fuel Rating Rule), 16 CFR 306. Under this Rule, sellers of liquid automotive fuels, including alternative fuels, must determine, certify, and post an appropriate automotive fuel rating. The automotive fuel rating for gasoline and gasoline-oxygenate blends is the antiknock index (octane rating). The automotive fuel rating for alternative liquid automotive fuels consists of the common name of the fuel, along with a disclosure of the amount, expressed as a minimum volume percent of the principal component of the fuel. For alternative liquid automotive fuels, a disclosure of other components, expressed as a minimum volume percent, may be included, if desired.

(Amended 2018)

1.5. Automotive Gasoline, Automotive Gasoline-Oxygenate Blend. – A type of fuel suitable for use in spark ignition automobile engines containing small amounts of fuel additives and also commonly used in marine and non-automotive applications.

(Amended 2018)

1.6. Aviation Gasoline. – A type of gasoline suitable for use as a fuel in an aviation spark-ignition internal combustion engine.

1.7. Aviation Turbine Fuel. – A refined middle distillate suitable for use as a fuel in an aviation gas turbine internal combustion engine.

1.8. Biodiesel. – A fuel comprised of at least 99 % by volume mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100 or B99.

(Amended 2018)

1.9. Biodiesel Blend. – A fuel comprised of a blend of biodiesel with hydrocarbon diesel fuel.

(Amended 2018)

1.10. Butanol. – Butyl alcohol, the chemical compound C_4H_9OH, a colorless substance existing in four isomeric forms.

(Added 2018)

1.11. Cetane Number. – A numerical measure of the ignition performance of a diesel fuel obtained by comparing it to reference fuels in a standardized engine test.

1.12. Compressed Natural Gas (CNG). – Natural gas which has been compressed and dispensed into fuel storage containers and is suitable for use as an engine fuel.

1.13. Denatured Fuel Ethanol. – An ethanol blend component for use in gasoline-ethanol blends and ethanol flex fuel. The ethanol is rendered unfit for beverage use by the addition of denaturants under formulas approved by the Alcohol and Tobacco Tax and Trade Bureau (TTB) (**ttb.gov/**), by the latest version of ASTM D4806, "Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark Ignition Engine Fuel" describes the acceptable denaturants for denatured fuel ethanol to be blended into spark ignition engine fuels.

(Amended 2014)

1.14. Diesel Exhaust Fluid (DEF). – A preparation of aqueous urea [(NH2)2CO], containing 32.5 % by mass of technically-pure urea in high-purity water with quality characteristics defined by the latest version of ISO 22241, "Diesel engines – NOx reduction agent AUS 32."

(Added 2014)

1.15. Diesel Fuel. – A refined hydrocarbon suitable for use as a fuel in a compression-ignition (diesel) internal combustion engine that may contain a combination of biodiesel, renewable diesel, and fuel additives.

(Amended 2018)

1.16. Director. – The Director, Commissioner, or other authority having jurisdiction over a department and/or their designated agent(s).

(Added 2018)

1.17. Distillate. – Any product obtained by condensing the vapors given off by boiling petroleum or its products.

1.18. EPA (**www.epa.gov**) – The United States Environmental Protection Agency.

1.19. Energy Institute (EI) (knowledge.energyinst.org/)**.** – A professional organization for the energy industry, developing standards, and other technical documents.

(Added 2018)

1.20. Engine Fuel. – Any liquid or gaseous matter used for the generation of power in an internal combustion engine.

1.21. Engine Fuels Designed for Special Use. – Engine fuels designated by the Director as requiring registration. These fuels normally do not have ASTM or other national consensus standards applying to their quality or usability; common special fuels are racing fuels and those intended for agricultural and other off-road applications.

1.22. Ethanol. – Also known as "ethyl alcohol." Ethanol is provided in gasoline-ethanol blends by blending denatured fuel ethanol. (See Section 1.13. Denatured Fuel Ethanol.)

(Amended 2014)

1.23. Ethanol Flex Fuel. – Blends of ethanol and hydrocarbons restricted for use as fuel in ground vehicles equipped with flexible-fuel spark-ignition engines.

(Amended 2014)

1.24. Flexible Fuel Vehicle. – A vehicle designed to operate on either unleaded gasoline or ethanol flex fuel or mixtures of both. Flexible fuel vehicles may also be designated to run on M85 Fuel Methanol.

(Added 2018)

1.25. Fuel Additive. – A material added to a fuel in small amounts to impart or enhance desirable properties or to suppress undesirable properties.

(Added 2018)

1.28. Gasoline. – A volatile mixture of liquid hydrocarbons containing small amounts of additives suitable for use as a fuel in a spark-ignition internal combustion engine.

(Amended 2018)

1.29. Gasoline-Oxygenate Blend. – A fuel consisting primarily of gasoline along with a substantial amount (more than 1 % by volume oxygenate, or more than 0.3 % by volume methanol not to exceed the total oxygen content permitted by applicable laws and regulations. Examples of oxygenates used in gasoline-alcohol blends are ethanol and butanol.

(Amended 2018)

1.32. Internal Combustion Engine. – A device used to generate power by converting chemical energy bound in the fuel via spark-ignition or compression ignition combustion into mechanical work to power a vehicle or other device.

(Added 2012)

1.33. International Organization for Standardization (ISO) (www.iso.org). – An independent international organization with a membership of national standards and bodies.

(Added 2018)

1.35. Lead Substitute. – An EPA-registered gasoline additive suitable, when added in small amounts to fuel, to reduce or prevent exhaust valve recession (or seat wear) in automotive spark-ignition internal combustion engines designed to operate on leaded fuel.

1.36. Lead Substitute Engine Fuel. – For labeling purposes, a gasoline or gasoline-oxygenate blend that contains a "lead substitute".

1.39. Low Temperature Operability. – A condition which allows the uninterrupted operation of a diesel engine through the continuous flow of fuel throughout its fuel delivery system at low temperatures. Fuels with adequate low temperature operability characteristics have the ability to avoid wax precipitation and clogging in fuel filters.

(Added 1998) (Amended 1999)

1.41. Lubricity. – A qualitative term describing the ability of a fluid to affect friction between, and wear to, surfaces in relative motion under load.

(Added 2003)

1.42. M85 Fuel Methanol. – A blend of methanol and hydrocarbons of which the methanol portion is nominally 70 to 85 volume percent.

1.43. Motor Octane Number. – A numerical indication of a spark-ignition engine fuel's resistance to knock obtained by comparison with reference fuels in a standardized ASTM D2700, "Motor Method Engine Test."

1.45. MTBE. – Methyl tertiary-butyl ether, the chemical compound $(CH_3)_3COCH_3$ [$C_5H_{12}O$].

(Added 2008) (Amended 2018)

1.47. Oxygen Content of Gasoline. – The percentage of oxygen contained in a gasoline.

(Amended 2018)

1.48. Oxygenate. – An oxygen-containing, ashless, organic compound, such as an alcohol or ether, which can be used as a fuel or fuel supplement.

1.49. Racing Gasoline. – A specialty fuel typically used in non-road racing vehicles that is generally of lower volatility, has a narrower boiling range and a higher octane rating than gasolines made for use in conventional passenger vehicles.

(Added 2018)

1.50. Research Octane Number. – A numerical indication of a spark-ignition engine fuel's resistance to knock obtained by comparison with reference fuels in a standardized in the latest version of ASTM D2699, "Research Method Engine Test."

(Amended 2018)

1.51. SAE (SAE International) (www.sae.org). – A technical organization for engineers, scientists, technicians, and others who cooperate closely in the engineering, design, manufacture, use, and maintainability of self-propelled vehicles.

1.52. Thermal Stability. – The ability of a fuel to resist the thermal stress which is experienced by the fuel when exposed to high temperatures in a fuel delivery system. Such stress can lead to formation of insoluble gums or organic particulates. Insolubles (e.g., gums or organic particulates) can clog fuel filters and contribute to injector deposits.

(Added 1998) (Amended 1999 and 2018)

1.53. Unleaded. – When used in conjunction with "engine fuel" or "gasoline" means any gasoline or gasoline-oxygenate blend to which no lead or phosphorus compounds have been intentionally added and which contains not more than 0.013 g of lead per liter (0.05 g lead per U.S. gallon) and not more than 0.0013 g of phosphorus per liter (0.005 g phosphorus per U.S. gallon).

1.54. Wholesale Purchaser Consumer. – Any person who is an ultimate consumer of gasoline, fuel methanol, ethanol flex fuel, diesel fuel, biodiesel, biodiesel blends, fuel oil, kerosene, aviation turbine fuels, natural gas, compressed natural gas, or liquefied petroleum gas and who purchases or obtains the product from a supplier and receives delivery of that product into a storage tank.

(Added 1998) (Amended 1999 and 2014)

Section 2. Standard Specifications

2.1. Gasoline and Gasoline-Oxygenate Blends.

2.1.1. Gasoline and Gasoline-Oxygenate Blends (as defined in this regulation). – Shall meet the latest version of ASTM D4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel" except for the permissible offsets for ethanol blends as provided in Section 2.1.2.Gasoline-Ethanol Blends.

(a) The maximum concentration of oxygenates contained in gasoline-oxygenate blends shall not exceed those permitted by the EPA under Section 211 of the Clean Air Act and applicable waivers.

(Added 2009) (Amended 2018)

2.1.2. Gasoline-Ethanol Blends. – When gasoline is blended with denatured fuel ethanol, the denatured fuel ethanol shall meet the latest version of ASTM D4806, "Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel," and the blend shall meet the latest version of ASTM D4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," with the following permissible exceptions:

(a) The maximum vapor pressure shall not exceed the latest edition of ASTM D4814 limits by more than:

(1) 1.0 psi for blends containing 9 to 10 volume percent ethanol from June 1 through September 15 as allowed by EPA.

(Amended 2016 and 2018)

NOTE 1: *The values shown above appear only in U.S. customary units to ensure that the values are identical to those in ASTM standards and the Environmental Protection Agency regulation.*

(Added 2009) (Amended 2012 and 2016)

2.1.3. Minimum Antiknock Index (AKI). – The AKI shall not be less than the AKI posted on the product dispenser or as certified on the invoice, bill of lading, shipping paper, or other documentation;

2.1.4. Minimum Motor Octane Number. – The minimum motor octane number shall not be less than 82 for gasoline with an AKI of 87 or greater;

2.1.5. Lead Substitute Gasoline. – Gasoline and gasoline-oxygenate blends sold as "lead substitute" gasoline shall contain a lead substitute which provides protection against exhaust valve seat recession equivalent to at least 0.026 g of lead per liter (0.10 g per U.S. gallon).

2.1.5.1. Documentation of Exhaust Valve Seat Protection. – Upon the request of the Director, the lead substitute additive manufacturer shall provide documentation to the Director that demonstrates that the treatment level recommended by the additive manufacturer provides protection against exhaust valve seat recession equivalent to or better than 0.026 g/L (0.1 g/gal) lead. The Director may review the documentation and approve the lead substitute additive before such additive is blended into gasoline. This documentation shall consist of:

(a) test results as published in the Federal Register by the EPA Administrator as required in Section 211(f)(2) of the Clean Air Act; or

(b) until such time as the EPA Administrator develops and publishes a test procedure to determine the additive's effectiveness in reducing valve seat wear, test results and description of the test procedures used in comparing the effectiveness of 0.026 g per liter lead and the recommended treatment level of the lead substitute additive shall be provided.

2.1.6. Blending. – Leaded, lead substitute, and unleaded gasoline-oxygenate blends shall be blended according to the EPA "substantially similar" rule or an EPA waiver for unleaded fuel.

(Amended 2009)

2.2. Diesel Fuel. – Shall meet the following requirements, based on the biodiesel concentration of the fuel:

(a) Diesel fuel that contains less than or equal to 5 % by volume biodiesel shall meet the latest version of ASTM D975, "Standard Specifications for Diesel Fuels Oils" and shall be sold as diesel fuel.

(b) Diesel fuel that contains greater than or equal to 6 % by volume biodiesel and that contains less than or equal to 20 % by volume shall meet the latest version of ASTM D7467, "Standard Specifications for Diesel Fuel Oil, Biodiesel Blend (B6 to B20)."

(c) Only fuel additive registered with the U.S. EPA may be used to additize diesel fuel, and the final product shall meet the latest version of ASTM D975 and/or ASTM D7467.

(Amended 2003 and 2018)

2.2.1. Premium Diesel Fuel. – All diesel fuels identified on retail dispensers, bills of lading, invoices, shipping papers, or other documentation with terms such as premium, super, supreme, plus, or premier must conform to the following requirements:

(a) **Cetane Number.** – A minimum cetane number of 47.0 as determined by the latest version of ASTM D613, "Standard Test Method for Cetane Number of Diesel Fuel Oil."

(b) **Low Temperature Operability.** – A cold flow performance measurement which meets the latest version of ASTM D975, "Standard Specification for Diesel Fuel Oils," tenth percentile minimum ambient air temperature charts and maps by either ASTM Standard Test Method D2500 (Cloud Point) or the latest version of ASTM Standard D4539, "Low Temperature Flow Test, LTFT." Low temperature operability is only applicable October 1 to March 31 of each year.

(c) **Thermal Stability.** – A minimum reflectance measurement of 80 % as determined by the latest version of ASTM Standard Test Method D6468 (180 min, 150 °C).

(d) **Lubricity.** – A maximum wear scar diameter of 520 micrometers as determined by the latest version ASTM D6079, "Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR)." If an enforcement jurisdiction's single test of more than 560 micrometers is determined, a second test shall be conducted. If the average of the two tests is more than 560 micrometers, the sample does not conform to the requirements of this part.

(Amended 2003)

2.3. Aviation Turbine Fuels. – Shall meet the latest version of the following standards as appropriate:

(a) ASTM D1655, "Standard Specification for Aviation Turbine Fuels."

(b) ASTM D6615, "Standard Specification for Jet B Wide-Cut Aviation Turbine Fuel."

(c) ASTM D7223, "Standard Specification for Aviation Certification Turbine Fuel."

(d) ASTM D7566, "Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons."

(Amended 2018)

2.4. Aviation Gasoline. – Shall meet the latest version of one of the following as appropriate:

(a) ASTM D910, "Standard Specification Leaded for Aviation Gasoline."

(b) ASTM D6227, "Standard Specification for Grade 82 Unleaded Aviation Gasoline."

(c) ASTM 7547, "Standard Specification for Hydrocarbon Unleaded Aviation Gasoline."

(Amended 2008 and 2018)

2.6. Kerosene (Kerosine). – Shall meet the latest version of ASTM D3699, "Standard Specification for Kerosine."

2.7. Denatured Fuel Ethanol. – Intended for blending with gasoline shall meet the latest version of ASTM D4806, "Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel."

(Amended 2014)

2.11. Ethanol Flex Fuel. – Ethanol flex fuel is covered by one of two ASTM standards based on the ethanol concentration of blend:

(a) Ethanol flex fuel containing 51 to 83 volume percent ethanol shall meet the latest version of ASTM D5798, "Standard Specification for Ethanol Fuel Blends for Flexible Fuel Automotive Spark-Ignition Engines"; and

(b) Ethanol flex fuel containing 16 to 50 volume percent ethanol shall be blended, stored, delivered and offered for consumption in accordance with the latest version of ASTM D7794, "Standard Practice for Blending Mid-Level Ethanol Fuel Blends for Flexible Fuel Vehicles with Automotive Spark-Ignition Engines."

(Amended 2018)

(Added 1997) (Amended 2014 and 2018)

2.12. M85 Fuel Methanol. – Shall meet the latest version of ASTM D5797, "Standard Specification for Fuel Methanol M70-M85 for Automotive Spark Ignition Engines."

(Added 1997)

2.13. Racing Gasoline. – Shall meet the following requirements:

(a) the Minimum Antiknock Index (AKI) shall not be less than the AKI posted on the product dispenser or as certified on the invoice, bill of lading, shipping paper, or other documentation.

(b) the product specification limits shall be those as declared by the manufacturer's product specifications. Upon the request of the Director, each supplier of racing gasoline shall provide a copy of the manufacturer's product specifications.

(Added 2018)

2.17. Biodiesel Blendstock. – Biodiesel intended for blending with diesel fuel shall meet the latest version of ASTM D6751, "Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels." Any blend stock less than 99 % by volume biodiesel (no more than 1 %

by volume diesel fuel). Any blend stock less than 99 % by volume shall not be used as a commercial blend stock for biodiesel blends without the permission of the Director.

(Added 2004) (Amended 2018)

2.18. Butanol for Blending with Gasoline. – Shall meet the latest version of ASTM D7862, "Standard Specifications for Butanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel."

(Added 2018)

2.19. Dimethyl Ether for Fuel Purposes. – Shall meet the latest version of ASTM D7901, "Standard Specifications for Dimethyl Ether for Fuel Purposes."

(Added 2018)

2.21. Diesel Exhaust Fluid (DEF). – Shall meet the latest version of the ISO 22241, "Diesel engines – NOx reduction agent AUS 32."

(Added 2014)

Section 3. Classification and Method of Sale

3.1. General Considerations.

3.1.1. Documentation. – When products regulated by this rule are sold, an invoice, bill of lading, shipping paper, or other documentation must accompany each delivery other than a retail sale. This document must identify the quantity, the name of the product, the particular grade of the product, the applicable automotive fuel rating, and oxygenate type and content (if applicable), the name and address of the seller and buyer, and the date and time of the sale. Documentation must be retained at the retail establishment for a period not less than one year.

(Amended 2008)

3.1.2. Retail Dispenser Labeling. – All retail dispensing devices must identify conspicuously the type of product (exception: gasoline and gasoline-oxygenate blends), the particular grade of the product (exception: No. 2 Diesel), and the applicable automotive fuel rating.

(Amended 2018)

3.1.3. Grade Name. – The sale of any product under any grade name that indicates to the purchaser that it is of a certain automotive fuel rating or ASTM grade shall not be permitted unless the automotive fuel rating or grade indicated in the grade name is consistent with the value and meets the requirements of Section 2, Standard Specifications.

3.1.4. Nozzle Requirements for Automotive Gasoline, Gasoline-Oxygenate Blends, and Diesel Fuel Dispensers. – Each retail dispensing device from which fuel products are sold shall be equipped with a nozzle spout having a diameter that conforms with the latest version of SAE J285, "Dispenser Nozzle Spouts for Liquid Fuel Intended for Use with Spark-Ignition and Compression Ignition Engines."

(Added 2018)

(Amended 2018)

3.2. Automotive Gasoline and Automotive Gasoline-Oxygenate Blends (Including Racing Gasoline).

3.2.1. Posting of Antiknock Index Required. – Automotive gasoline and automotive gasoline-oxygenate blends shall post the minimum antiknock index in accordance with applicable regulations, 16 CFR 306 issued pursuant to the "Petroleum Marketing Practices Act," as amended.

(Amended 2018)

3.2.2. Use of Lead Substitute Must be Disclosed. – Each dispensing device from which gasoline or gasoline-oxygenate blends containing a lead substitute is dispensed shall display the following legend: "Contains Lead Substitute." The lettering of this legend shall not be less than 12.7 mm (½ in) in height and the color of the lettering shall be in definite contrast to the background color to which it is applied.

3.2.3. Prohibition of Terms. – It is prohibited to use specific terms to describe a grade of gasoline or gasoline-oxygenate blend unless it meets the minimum antiknock index requirement shown in Table 1. Minimum Antiknock Index Requirements.

Table 1.
Minimum Antiknock Index Requirements

Term	Minimum Antiknock Index	
	ASTM D4814 Altitude Reduction Areas IV and V	All Other ASTM D4814 Areas
Premium, Super, Supreme, High Test	90	91
Midgrade, Plus	87	89
Regular, Unleaded (alone)	85	87
Economy	--	86

(Table 1. Amended 1997 and 2018)

3.2.4. Method of Retail Sale. – Type of Oxygenate must be disclosed. All automotive gasoline or automotive gasoline-oxygenate blends, or racing gasoline kept, offered, or exposed for sale, or sold at retail containing more than one volume percent oxygenate shall be identified as "with" or "containing" (or similar wording) the predominant oxygenate in the engine fuel. For example, the label may read "contains ethanol" or "with methyl *tertiary*-butyl ether (MTBE)." The oxygenate contributing the largest mass percent oxygen to the blend shall be considered the predominant oxygenate. Where mixtures of only ethers are present, the retailer

may post the predominant oxygenate followed by the phrase "or other ethers" or alternatively post the phrase "contains MTBE or other ethers." In addition, gasoline-methanol blends containing more than 0.3 % by volume methanol shall be identified as "with" or "containing" methanol. This information shall be posted on the upper 50 % of the dispenser front panel in a position clear and conspicuous from the driver's position in a type at least 12.7 mm (½ in) in height, 1.5 mm (1/16 in) stroke (width of type).

(Amended 1996 and 2018)

3.2.5. Documentation for Dispenser Labeling Purposes. – For automotive gasoline, automotive gasoline-oxygenate blends or racing gasoline, the retailer shall be provided, at the time of delivery of the fuel, on product transfer documents such as an invoice, bill of lading, shipping paper, or other documentation:

(a) Information that complies with 40 CFR 80.1503 when the fuel contains ethanol.
(Added 2014)

For fuels that do not contain ethanol, information that complies with 40 CFR 80.1503 and a declaration of the predominant oxygenate or combination of oxygenates present in concentrations sufficient to yield an oxygenate content of at least 1.0 % by volume in the fuel. Where mixtures of only ethers are present, the fuel supplier may identify either the predominant oxygenate in the fuel (i.e., the oxygenate contributing the largest mass percent oxygen) or alternatively, use the phrase "contains MTBE or other ethers."
(Added 2014)

Gasoline containing more than 0.3 % by volume methanol shall be identified as "with" or "containing" methanol.
(Added 2014) (Amended 2018)

(Amended 1996, 2014, and 2018)

3.2.6. EPA Labeling Requirements. – Retailers and wholesale purchaser-consumers of gasoline shall comply with the EPA pump labeling requirements for gasoline containing greater than 10 volume percent (v%) up to 15 volume percent (v%) ethanol (E15) under 40 CFR 80.1501. (For additional information, refer to Section 3.8.2. FTC Labeling Requirements.)

(Added 2012) (Amended 2018)

(Amended 2018)

3.3. Diesel Fuel.

3.3.1. Labeling of Grade Required. – Diesel Fuel other than No 2-D shall be identified by grade.

(Amended 2018)

3.3.2. Automotive Fuel Rating. – Diesel fuel containing 6 % to 20 % by volume biodiesel shall be labeled with its automotive fuel rating in accordance with the FTC "Automotive Fuel Ratings, Certification and Posting Rule," 16 CFR 306.

(Added 2018)

3.3.3. Delivery Documentation for Premium Diesel. – Before or at the time of delivery of premium diesel fuel, the retailer or the wholesale purchaser-consumer shall be provided on an invoice, bill of lading, shipping paper, or other documentation a declaration of all performance properties that qualifies the fuel as premium diesel fuel as required in Section 2.2.1. Premium Diesel Fuel.

(Added 1998) (Amended 1999)

(Amended 1998, 1999, 2008, 2012, and 2018))

3.4. Aviation Turbine Fuels.

3.4.1. Labeling of Grade Required. – Aviation turbine fuels shall be identified by the grade terms contained in applicable ASTM Standard Specifications. (See EI 1542 for additional details.)

(Amended 2018)

3.4.2. NFPA Labeling Requirements Also Apply. [***NOTE 2***, page 196] – Each dispenser or airport fuel truck dispensing aviation turbine fuels shall be labeled in accordance with the most recent edition of National Fire Protection Association (NFPA 407), "Standard for Aircraft Fuel Servicing."

NOTE 2: *For example, NFPA 407, 2017 edition: Section 6.1.11.3. Signage. Each aircraft fuel servicing vehicle or cart shall have signage viewable from all sides of the vehicle. Signs shall have letters at least 75 mm (3 in) high. Signs shall be of a color contrasting sharply with the background for visibility. The words "FLAMMABLE," "NO SMOKING," and the name of the product carried, such as JET A, JET B, GASOLINE, or AVGAS shall appear on each sign. (**NOTE:** Refer to the most recent edition NFPA 407.)*

(Amended 2018)

3.5. Aviation Gasoline.

3.5.1. Labeling of Grade Required. – Aviation gasoline shall be identified by the grade terms contained in the latest version of ASTM Standard Specifications. (See EI 1542, "Identification Markings for Dedicated Aviation Fuel Manufacturing and Distribution Facilities, Airport Storage and Mobile Fueling Equipment" for additional detail.)

(Amended 2008 and 2018)

3.5.2. NFPA Labeling Requirements Also Apply. [***NOTE 2***, page 196] – Each dispenser or airport fuel truck dispensing aviation gasoline shall be labeled in accordance with the most recent edition of National Fire Protection Association (NFPA) 407, "Standard for Aircraft Fuel Servicing."

(Amended 2018)

3.8. Ethanol Flex Fuel.

3.8.1. How to Identify Ethanol Flex Fuel. – Ethanol flex fuel shall be identified as Ethanol Flex Fuel or EXX Flex Fuel.

3.8.2. FTC Labeling Requirements. – Ethanol flex fuel shall be identified and labeled in accordance with the Federal Trade Commission, Automotive Fuel Ratings, Certification and Posting, 16 CFR 306, as amended. (For additional information, refer to Section 3.2.6. EPA Labeling Requirements.)

(Amended 2007, 2008, 2014, and 2018)

3.9. M85 Fuel Methanol.

3.9.1. How to Identify M85 Fuel Methanol. – Fuel methanol shall be identified as M85.

Example:
M85

3.9.2. Retail Dispenser Labeling.

(a) Fuel methanol shall be labeled with its automotive fuel rating in accordance with 16 CFR 306.

Example:
M85 Methanol

(b) A label shall be posted which states "For Use in Vehicles Capable of Using M85 Only." This information shall be clearly and conspicuously posted on the upper 50 % of the dispenser front panel in a type of at least 12.7 mm (½ in) in height, 1.5 mm ($^1/_{16}$ in) stroke (width of type).

(Amended 2008)

3.15. Biodiesel and Biodiesel Blends.

3.15.1. Identification of Product. – Biodiesel Blendstock shall be identified by the term "biodiesel" with the designation "B100" or "B99."

(Amended 2018)

3.15.2. Labeling of Retail Dispensers.

3.15.2.1. Labeling of Grade Required. – Biodiesel shall be identified by the grades No. 1-B S15 or No. 1-B S500, or No. 2-B S500.

(Amended 2018)

3.15.2.2. Automotive Fuel Rating. – Biodiesel and biodiesel blends shall be labeled with its automotive fuel rating in accordance with the FTC Automotive Fuel Ratings, Certification and Posting Rule,16 CFR 306.

(Amended 2018)

3.15.2.3. Biodiesel Blends. – When biodiesel blends greater than 20 % by volume are offered by sale, each side of the dispenser where fuel can be delivered shall have a label conspicuously placed that states "Consult Vehicle Manufacturer Fuel Recommendations."

The lettering of this legend shall not be less than 6 mm (¼ in) in height by 0.8 mm ($^{1}/_{32}$ in) stroke; block style letters and the color shall be in definite contrast to the background color to which it is applied.

3.15.3. Documentation for Dispenser Labeling Purposes. – The retailer shall be provided, at the time of delivery of the fuel, a declaration of the volume percent biodiesel on an invoice, bill of lading, shipping paper, or other document. This documentation is for dispenser labeling purposes only; it is the responsibility of any potential blender to determine the amount of biodiesel in the diesel fuel prior to blending.

3.15.4. Exemption. – Biodiesel blends that contain less than or equal to 5 % biodiesel by volume are exempted from the requirements of Sections 3.15.1. Identification of Product, 3.15.2. Labeling of Retail Dispensers, and 3.15.3. Documentation for Dispenser Labeling Purposes when it is sold as "diesel fuel" as required in Section 3.3. Diesel Fuel.

(Added 2005) (Amended 2008 and 2018)

3.16. Diesel Exhaust Fluid (DEF).

3.16.1. Labeling of Diesel Exhaust Fluid (DEF). – DEF shall be labeled.

3.16.1.1. Retail Dispenser Labeling. – A label shall be clearly and conspicuously placed on the front panel of the DEF dispenser stating, "for operation of selective catalytic reduction (SCR) converters in motor vehicles with diesel engines."

3.16.1.2. Documentation for Retailers of Bulk Product. – A DEF supplier shall provide, at the time of delivery of the bulk shipment of DEF, identification of the fluid's origin including the name of the fluid manufacturer, the brand name, trade name, or trademark, and a statement identifying the fluid as DEF conforming to specifications given in the latest version of ISO 22241, "Diesel engines – NOx reduction agent AUS 32." This information shall be provided by the supplier on an invoice, bill of lading, shipping paper, or other document.

3.16.1.3. Labeling Packaged Product. – Any DEF retail package shall bear a label that includes the name of the fluid manufacturer, the brand name, trade name, or trademark, a statement identifying the fluid as DEF conforming to specifications given in the latest version of ISO 22241, "Diesel engines – NOx reduction agent AUX 32." And the statement, "It is recommended to store DEF between − 5 °C to 30 °C (23 °F to 86 °F)."

3.16.1.4. Documentation for Bulk Deliveries. – A carrier that transports or accepts for transportation any bulk shipment by tank truck, freight container, cargo tank, railcar, or any other vehicle used to transport or deliver bulk quantities of DEF shall, at the time of delivery of the DEF, provide identification of the fluid's origin including the name of the

fluid manufacturer, the brand name, trade name, or trademark, and a statement identifying the fluid as DEF conforming to specifications given in the latest version of ISO 22241, "Diesel engines – NOx reduction agent AUS 32." This information shall be provided to the recipient on an invoice, bill of lading, shipping paper, or other document.

Effective date shall be January 1, 2016.
(Added 2014)

Section 4. Retail Storage Tanks and Dispenser Filters

4.1. Water in Gasoline-Alcohol Blends, Biodiesel Blends, Ethanol Flex Fuel, Aviation Gasoline, and Aviation Turbine Fuel. – No water phase greater than 6 mm (¼ in) as determined by an appropriate detection paste or other acceptable means, is allowed to accumulate in any tank utilized in the storage of gasoline-alcohol blend, biodiesel, biodiesel blends, ethanol flex fuel, aviation gasoline, and aviation turbine fuel.
(Amended 2008, 2012, and 2014)

4.2. Water in Gasoline, Diesel, Gasoline-Ether, and Other Fuels. – Water shall not exceed 25 mm (1 in) in depth when measured with water indicating paste or other acceptable means in any tank utilized in the storage of diesel, gasoline, gasoline-ether blends, and kerosene sold at retail except as required in Section 4.1. Water in Gasoline-Alcohol Blends, Biodiesel Blends, Ethanol Flex Fuel, Aviation Gasoline, and Aviation Turbine Fuel.
(Amended 2008, 2012, and 2014)

4.3. Dispenser Filters.

4.3.1. Engine Fuel Dispensers.

(a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, ethanol flex fuel, and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.

(b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a 30 micron or smaller nominal pore-sized filter.

(Amended 2014)

4.3.2. Delivery of Aviation Fuel and Gasoline.

(a) Fuel delivery of aviation turbine fuel into aircraft shall be filtered through a fuel filter/separator conforming to EI 1581, "Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators."

(b) Fuel delivery of aviation gasoline into aircraft shall be filtered through a fuel filter/separator conforming to EI 1581, "Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators."

(Amended 2018)
(Added 2008) (Amended 2014 and 2018)

4.4. Product Storage Identification.

4.4.1. Fill Connection Labeling. – The fill connection for any fuel product storage tank or vessel supplying engine-fuel devices shall be permanently, plainly, and visibly marked as to the product contained.

(Amended 2008)

4.4.2. Declaration of Meaning of Color Code. – When the fill connection device is marked by means of a color code, the color code shall be conspicuously displayed at the place of business and the API color codes as specified and published in "API Recommended Practice 1637" shall be used.

(Amended 2018)

4.5. Volume of Product Information. – Each retail location shall maintain on file a calibration chart or other means of determining the volume of each regulated product in each storage tank and the total capacity of such storage tank(s). This information shall be supplied immediately to the Director.

Section 5. Condemned Product

5.1. Stop-Sale Order at Retail. – A stop-sale order may be issued to retail establishment dealers for fuels failing to meet specifications or when a condition exists that causes product degradation. A release from a stop-sale order will be awarded only after final disposition has been agreed upon by the Director. Confirmation of disposition shall be submitted in writing on form(s) provided by the Director and contain an explanation for the fuel's failure to meet specifications. Upon discovery of fuels failing to meet specifications, meter readings and physical inventory shall be taken and reported in confirmation for disposition. Specific variations or exemptions may be made for fuels designed for special equipment or services and for which it can be demonstrated that the distribution will be restricted to those uses.

5.2. Stop-Sale Order at Terminal or Bulk Plant Facility. – A stop-sale order may be issued when products maintained at terminals or bulk plant facilities fail to meet specifications or when a condition exists that may cause product degradation. The terminal or bulk storage plant shall immediately notify all customers that received those product(s) and make any arrangements necessary to replace or adjust to specifications those product(s). A release from a stop-sale order will be awarded only after final disposition has been agreed upon by the Director. Confirmation of disposition of products shall be made available in writing to the Director. Specific variations or exemptions may be made for fuels used for blending purposes or designed for special equipment or services and for which it can be demonstrated that the distribution will be restricted to those uses.

Section 6. Product Registration

6.1. Engine Fuels Designed for Special Use. – All engine fuels designed for special use that do not meet ASTM specifications or standards addressed in Section 2. Standard Specifications shall be registered with the Director on forms prescribed by the Director 30 days prior to when the

registrant wishes to engage in sales. The registration form shall include all of the following information:

6.1.1. Identity. – Business name and address(es).

6.1.2. Address. – Mailing address, if different than business address.

6.1.3. Business Type. – Type of ownership of the distributor or retail dealer, such as an individual, partnership, association, trust, corporation, or any other legal entity or combination thereof.

6.1.4. Signature. – An authorized signature, title, and date for each registration.

6.1.5. Product Description. – Product brand name and product description.

6.1.6. Product Specification. – A product specification sheet shall be attached.

6.2. Renewal. – Registration is subject to annual renewal.

6.3. Re-registration. – Re-registration is required 30 days prior to any changes in Section 6.1. Engine Fuels Designed for Special Use.

6.4. Authority to Deny Registration. – The Director may decline to register any product that actually or by implication would deceive or tend to deceive a purchaser as to the identity or the quality of the engine fuel.

6.5. Transferability. – The registration is not transferable.

Section 7. Test Methods and Reproducibility Limits

7.1. ASTM Standard Test Methods. – ASTM Standard Test Methods referenced for use within the applicable Standard Specification shall be used to determine the specification values for enforcement purposes.

7.1.1. Premium Diesel. – The following test methods shall be used to determine compliance with the premium diesel parameters:

(a) **Cetane Number.** – The latest version of ASTM D613, "Standard Test Method for Cetane Number of Diesel Fuel Oil";

(b) **Low Temperature Operability.** – The latest version of ASTM D4539, "Standard Test Method for Filterability of Diesel Fuels by Low-Temperature Flow Test (LTFT)" or ASTM D2500, "Standard Test Method for Cloud Point of Petroleum Products" (according to marketing claim);

(c) **Thermal Stability.** – The latest version of ASTM D6468, "Standard Test Method for High Temperature Stability of Middle Distillate Fuels" (180 min, 150 °C); and

(d) **Lubricity.** – The latest version of ASTM D6079, "Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High Frequency Reciprocating Rig (HFRR)."

(Amended 2003)

7.2. Reproducibility Limits.

7.2.1. AKI Limits. – When determining the antiknock index (AKI) acceptance or rejection of a gasoline sample, the AKI reproducibility limits as outlined in the latest version of ASTM D4814, "Standard Specification for Automotive Spark-Ignition Engine Fuel," Appendix X1 shall be acknowledged for enforcement purposes.

7.2.2. Reproducibility. – The reproducibility limits of the standard test method used for each test performed shall be acknowledged for enforcement purposes, except as indicated in Section 2.2.1. Premium Diesel Fuel and Section 7.2.1. AKI Limits. No allowance shall be made for the precision of the test methods for aviation gasoline or aviation turbine fuels.

(Amended 2008)

7.2.4. Dispute Resolution. – In the event of a dispute over a reported test value, the guidelines presented in the latest version of ASTM D3244, "Standard Practice for Utilization of Test Data to Determine Conformance with Specifications," shall be used to determine the acceptance or rejection of the sample.

7.2.5. Additional Enforcement Action. – The Director may initiate enforcement action in the event that, based upon a statistically significant number of samples, the average test result for products sampled from the same source location is greater than the legal maximum or less than the legal minimum limits (specification value), posted values, certified values, or registered values.

(Added 2008) (Amended 2018)

1135 M Street, Suite 110 | Lincoln, Nebraska 68508
P. 402.434.4880 **F.** 402.434.4878 **W.** www.ncwm.net