

## National Type Evaluation Program Liquid Measuring Devices – Checklists and Test Procedures for Retail Motor Fuel Dispensers

### 7. Indicating and Recording Elements

#### Code Reference: G-S.5.1. and G-UR.1.1. General

Indicating elements must be appropriately designed and adequate in amount. Specifically, a device must have sufficient display capacity to indicate the quantities and total prices, if it applies in the normal encountered specific application. Electronic devices shall either have sufficient display capacity to indicate the normal quantities and money values or automatically stop the delivery before exceeding the display capacity of either the quantity or total price. Analog indicating elements are required to have sufficient display capacity, or the device is not suitable for the application. This consideration may apply when evaluating a system that may be used in either a truck stop or an automobile service station.

- 7.1. Analog dispensers shall have adequate display capacity for the application.  Yes  No  N/A
- 7.2. An electronic digital indicating element shall either:
- 7.2.1. Have adequate display capacity for the application. **OR**  Yes  No  N/A
- 7.2.2. Automatically stop the delivery before exceeding the maximum quantity or maximum total price that can be indicated.  Yes  No  N/A

#### Code Reference: G-S.5.2.2. Digital Indication and Representation; S.1.6.6. Agreement Between Indications

Basic operating requirements for devices are that:

- All digital values of like value in a system shall agree.
- A digital value shall agree with its analog representation to the nearest minimum graduation.
- Digital values shall round off to the nearest digital division that can be indicated or recorded.
- When a digital zero display is provided, the zero indication shall consist of at least one digit to the left and all digits to the right of the decimal point.

Due to limitations of some of the technologies used to transmit information from dispensers to service station consoles, some exceptions to these rules have been given to the indications on retail motor fuel dispensers and service station consoles. Exact agreement of digital quantity values is not required if only total price information is sent from the dispenser to the console. In these cases, the console calculates the quantity from the unit price set in the console. Consequently, the quantity indicated on the console may not agree exactly with the quantity indicated on the dispenser. However, if the console prints a customer receipt, then the quantity **time's** unit price must equal the total price on both the dispenser and the printed receipt. **In 2012, provisions were added to allow systems to apply post-delivery discounts. In cases where a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the exception mentioned above does not apply and, therefore, the total volume quantity of the delivery shall be in agreement between all elements in the system.**

Previously, the service station console was considered an auxiliary indication and did not have to satisfy the mathematical agreement requirement for money values (G-S.5.5.) A non-retroactive requirement effective January 1, 1988 requires all service station consoles installed after January 1, 1988 (not just new models) to satisfy the mathematical agreement of money values requirement (S.1.6.6.) The money value indication **prior to the application of any post-delivery discount** for dispensers and consoles must agree for all installations, both old and new.

For those systems consisting of a console and dispensers and equipped with pre-set volume, the dispenser must deliver at least the pre-set volume; it cannot deliver less. For example, if the console sends only the money equivalent of the pre-set volume to the dispenser, the dispenser shall deliver at least the pre-set volume. It may not stop at the first quantity amount that results in mathematical agreement with the money value equivalent of the pre-set volume if the quantity indication is less than the pre-set volume. Similarly, if a money value is pre-set, the dispenser is not properly designed if it always stops at the lowest quantity value that provides mathematical agreement with the pre-set money value.

Tests for agreement of digital values shall be performed in the post pay, prepay money, and pre-set volume modes. Agreement should be checked at several unit prices including the maximum unit price and with the dispenser operating at its maximum flow rate.

- 7.3. All total sale money value indications in a computing system are primary indications and must agree **prior to the application of any post-delivery discount**.  Yes  No  N/A
- 7.4. Digital volume indications in a non-computing system must agree or "round off" to the nearest minimum unit that can be indicated or recorded.  Yes  No  N/A
- 7.5. Manual quantity entries in invoice billing systems must be identified as such.  Yes  No  N/A
- 7.6. When delivery from a computing device is based upon a pre-set volume, the quantity indicated on the dispenser and any auxiliary device must be equal to or greater than the pre-set volume and the dispenser and remote console must comply with G-S.5.5. Money Values, Mathematical Agreement.  Yes  No  N/A
- 7.7. The quantity, unit price, and total price indications on the console shall be in mathematical agreement **prior to the application of any post-delivery discount**.  Yes  No  N/A
- 7.8. The following applies when a quantity value indicated or recorded by an auxiliary element such as a console, ticket printer, or remote customer display, is a derived or computed value based on data received from a retail motor fuel dispenser.
  - 7.8.1. The quantity values indicated or recorded on a console, electronic cash register, or other auxiliary indicating or recording element may differ, however:
    - 7.8.1.1. All indicated or recorded total money values for an individual sale shall agree. **AND**  Yes  No  N/A
    - 7.8.1.2. The indicated or recorded quantity, unit price, and total sales price values shall be in mathematical agreement to the closest cent (e.g., within each element, the values indicated or recorded must meet the formula [quantity x unit price = total sales price] to the closest cent.)  Yes  No  N/A  
 Examples: \$1.5549 rounds to \$1.55  
 \$1.5551 rounds to \$1.56  
 \$1.5550 rounds to either \$1.55 or \$1.56
- 7.9. The printed ticket and dispenser must comply with G.S.5.5. Money Values, Mathematical Agreement to the nearest cent (unit price x volume = total sale ± 0.5 cent.)  Yes  No  N/A
- 7.10. Digital values agree with their associated analog value to the nearest minimum graduation.  Yes  No  N/A

**Code Reference: G-S.5.5. Digital Money Values, Mathematical Agreement**

Any recorded money value and any digital money value indication on a primary indicator must agree mathematically with its associated quantity (volume) representation or indication to the nearest one cent.

**Formula: Unit Price x Indicated Volume = Total Sale ± 0.5 cent**

- 7.11. Check mathematical agreement of all primary indications (e.g., dispenser, console, printer) under the following conditions:
  - 7.11.1. At various flow rates, including maximum and minimum.  Yes  No  N/A
  - 7.11.2. Snapping nozzle on and off several times during delivery. Check mathematical agreement each time flow is halted.  Yes  No  N/A
  - 7.11.3. At several unit prices including the low prices and the maximum pricing capability of the computer and when operating at the maximum flow rate.  Yes  No  N/A
  - 7.11.4. Turn the dispenser off during delivery with nozzle open.  Yes  No  N/A

## Code Reference: G-S.5.1. Indicating and Recording Elements/General

### Discount Pricing

*NIST Handbook 44* requires that, except for dispensers used for fleet sales, other price contract sales, truck refueling (e.g., truck stop dispensers used only to refuel trucks), when a product or grade is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made prior to delivery using controls on the device or **through the deliberate action of the purchaser using: 1) controls on the device; 2) personal or vehicle mounted electronic equipment communicating with the system; or 3) verbal instructions**~~other customer-activated controls~~.

Should the customer elect to use another method of payment following completion of delivery, the console may be used to recalculate the total price — provided the dispenser complies with all applicable *NIST Handbook 44* requirements. For example, the customer selects the credit card unit price on the dispenser and dispenses product at that unit price. However, the customer discovers that he forgot his credit card and decides to pay cash. In this case, the console might be used to calculate the total price at the cash unit price. In keeping with the intent of National Conference on Weights and Measures action in 1989 to require dispensers to calculate at all unit prices for which a product is offered for sale, it is anticipated that the console would be required to recalculate the new total price using the formula (quantity x unit price = total price.) Except for fleet sales and other contract sales, a receipt providing the total **volume**, unit price, total computed price and product identity 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. (Code Reference S.1.6.7) **as the transaction was completed**. The recorded and displayed total **volume-fuel price** on the receipt and dispenser, respectively, shall agree.

**In cases where a post-delivery discount(s) is applied, the sales receipt must provide the product identity; the total quantity, unit price, and total computed price that were displayed on the dispenser at the end of the delivery prior to any post-delivery discount(s); an itemization of the post-delivery discounts to the unit price; and the final total price of each fuel sale after all post-delivery discounts are applied. (Code Reference S.1.6.8.)**

### Selectable Unit Price Capability

Selectable unit price capability is a design feature that permits the customer to select the unit price for a particular transaction at the time of sale. A dispenser may then allow the unit price for a delivery to be selected from two or more unit prices **through the deliberate action of the purchaser using: 1) controls on the device; 2) personal or vehicle mounted electronic equipment communicating with the system; or 3) verbal instructions**.

If the customer selects the unit price at the dispenser (e.g., cash or credit price), the selection may be made at any time prior to the start of product flow. The dispenser operating handle may be on when the selection is made. A system shall not permit a change to the unit price during delivery of product.

After a transaction is completed, the unit price displayed at the dispenser may be changed to a base unit price. However, the quantity and total price must be displayed on the face of the dispenser for at least 5 minutes or until the next transaction is initiated. Any display of quantity, unit price, and total price that does not mathematically agree occurs between transactions. This is permitted (in response to demands of device users) because the displayed values between "transactions" are not "significant" relative to the actual delivery process (transaction.)

The displayed unit price may revert to the base unit price immediately after the completion of a transaction, defined as the time the delivery has been terminated and payment has been settled. The payment may be automatic if the delivery is to a pre-paid amount. If the sale is prepaid, the delivery is considered terminated after the "handle" is in the off position or after the nozzle has been returned to the designed hanging position. This will allow the customer adequate time to observe that the prepaid amount has been reached. If the delivery stops short or overruns a prepaid amount, settling the payment means that money is either refunded or collected from the customer and the transaction is "cashed out" by the console operator.

In the case of invoice billing systems, such as card-lock or key-lock systems which compute the total sale price, it is considered not appropriate for the displayed unit price to revert to the base unit price immediately following a transaction. Because a receipt for the transaction may not be available, the customer must be allowed an adequate period of time following the delivery to record the transaction information. The transaction unit price must be displayed for at least 30 seconds, and the total price and the quantity must be displayed for at least 5 minutes following the completion of the delivery or the start of the next transaction. The delivery is considered complete after the "handle" is off or the nozzle has been returned to its designed hanging position.

7.12. A dispenser may be equipped with means for selecting more than one unit price,  Yes  No  N/A

provided that the selected unit price cannot be changed after the initial flow begins.

- 7.13. The selected unit price must be made clearly evident on the dispenser.  Yes  No  N/A
- 7.14. Once selected the unit price cannot be changed by the operator at the console prior to or during the delivery.  Yes  No  N/A
- 7.15. The selected unit price displayed at the dispenser prior to the delivery of product must be continuously displayed at the conclusion of the delivery by moving the operating mechanism to the "off" position, until the start of the next transaction by:
  - 7.15.1. Movement of the operating mechanism to the "on" position. **OR**  Yes  No  N/A
  - 7.15.2. "Authorization/Approval" by the console operator, whichever occurs first.  Yes  No  N/A
- 7.16. 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 5 minutes or until the next transaction is initiated by using controls on the device or other user-activated (e.g., customer-activated) controls.  Yes  No  N/A
- 7.17. In a system where a base unit price is automatically displayed on the dispenser after the completion of a transaction (e.g., product is dispensed and payment is settled), the dispenser may display the values for quantity, unit price, and total price that do not result in a mathematically correct equation. That is provided when the total price value displayed is divided by the quantity value displayed, the result is a unit price that is "posted" for a particular kind of transaction.  Yes  No  N/A

**Credit Card- or Debit Card-Activated Retail Motor Fuel Dispenser**

On card-activated retail motor fuel dispensers, the customer authorizes the dispenser by inserting the card or swiping the card through a slot. On credit card transactions, the customer is typically billed through the same methods as have been used for credit transactions handled through a station attendant. On debit card transactions, payment is made directly from the purchaser's account by electronic funds transfer.

- 7.18. A receipt must be available to the customer at the completion of the transaction. The issuance of the receipt may be initiated at the option of the customer.  Yes  No  N/A
- 7.19. The customer receipt must contain the following information:
  - 7.19.1. The identity (codes may be used) of the product purchased, the quantity purchased, the unit price, and the total price.  Yes  No  N/A
- 7.20. Cash Value Card - A cash value card that is initially encoded with the purchase price, authorizing a customer to purchase products up to the current cash value of the card. The value of the card is decreased in amounts equal to individual transactions.
 

Means shall be provided to the customer to determine the initial cash value of the card and the remaining cash value prior to and after each transaction.
- 7.21. Invoice Billing - Invoice billing is a process in which customers are billed for one or more transactions at the end of a billing period.
  - 7.21.1. For computing systems, the date, quantity, unit price, and total price shall be recorded and shall agree with the indications on the dispenser.  Yes  No  N/A
  - 7.21.2. When non-computing analog dispensers are used and the billing is on the basis of individual quantities for each transaction (non-cumulative), the value of the smallest unit of displayed quantity for each transaction shall be not greater than 0.1 gallon providing the "pulser" and the recorded quantity used for billing are each equal to or less than 0.01 gallon.  Yes  No  N/A
  - 7.21.3. All displayed transaction information must be shown for at least 30 seconds after completing a delivery or starting the next transaction. The delivery is considered complete after the "handle" is off or after the nozzle has been returned to its designed hanging position.  Yes  No  N/A

**Code Reference: S.1.6.5.2. Money-Value Divisions, Digital**

- 7.22. 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-liter intervals for devices indicating in metric units or 0.01-gallon intervals for devices indicating in inch-pound units.  Yes  No  N/A

*Note: At least four decimal places in cents must be carried to determine the proper round off of money values.*

**Code Reference: S.1.2. Primary Elements/Units**

- 7.23. 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.  Yes  No  N/A

**Code Reference: S.1.2.3. Value of Smallest Unit**

- 7.24. The value of the quantity division shall not exceed the equivalent of 0.5 L (0.1 gal) on retail devices with a flow rate of 750 L/min (200 gal/min) or less.  Yes  No  N/A

**Code Reference: S.1.6.1. Indication of Delivery**

- 7.25. Retail devices shall automatically show their initial zero condition and amount delivered up to the nominal capacity of the device. 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 the delivery starts at zero.  Yes  No  N/A
- 7.26. 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.  Yes  No  N/A

**Test Method Steps:**

1. Set unit price on dispenser.
2. Pressurize system.
3. Turn the dispenser off.
4. Create void in dispenser hydraulics by opening the fuel nozzle to provide a zero internal pressure. Then close the fuel nozzle.
5. Activate the dispenser and let the system reset (for example, showing "8"s and then zero, running through a segment check, or using another method of resetting the system).
6. With the nozzle closed, watch the main sales display for advancement of total sales and total volume for at least 5 seconds and no more than 10 seconds.
7. No advancement constitutes a passing test.
8. Advancement constitutes a failed test.
9. Replace the fuel nozzle and turn off the dispenser.
10. Repeat this test 2 more times. *Note: The evaluator must be aware that a time delay for this feature may be incorporated.*
11. Device passes test.  Yes  No  N/A

**Code Reference: S.1.6.2.1. and S.1.6.2.2. Provisions for Power Loss**

Even if power fails during a delivery, it is still necessary to correctly complete all transactions in progress at the time of the power failure. Quantity and total sales price information shall be recallable for at least 15 minutes after the power failure. The information may be recalled at the dispenser or at the console if the console indications are accessible to the customer. Operator information, such as fuel and money value totals, shall be retained in memory during a power failure. The operator information is not required to be recallable during the power failure, but shall be recallable after power is restored. Test to determine if the indications are accurate when the delivery is continued after a power failure.

*Note: For remote controllers (e.g., cash register, console, etc.) which have the capability to retain information pertaining to a transaction (e.g., stacked completed sales.) If the information cannot be recalled at the dispenser following a power outage, means (e.g., uninterruptible power supply or other means) must be provided to enable the transaction information to be recalled and verified for at least 15 minutes following a power outage.*

- 7.27. The quantity and total sales price shall be recallable for 15 minutes after the power failure.  Yes  No  N/A
- 7.28. The quantity and total sales price values shall be correct if the power fails between deliveries.  Yes  No  N/A
- 7.29. The quantity and total sales price values shall be correct if the delivery is continued after a power failure.  Yes  No  N/A
- 7.30. The operator's information shall be retained in memory during a power failure.  Yes  No  N/A
- 7.31. Remote controllers which stack completed sales must have a means to enable the transaction information to be recalled and verified for at least 15 minutes.  Yes  No  N/A

**Code Reference: S.1.6.3. Return to Zero**

The primary indicating and recording elements of a retail device shall readily return to a definite zero indication. Key-lock and other self-operated devices must have a zero-return indicating element, but they are not required to have the recording element return to zero. These devices may be equipped with cumulative recording elements. The primary indicating and recording elements shall not go beyond their correct zero position.

- 7.32. Does the device have a primary recording element?  Yes  No  N/A
- 7.33. The indicating and recording elements of a retail device shall readily returnable to a definite zero indication.  Yes  No  N/A
- 7.34. Key-lock and self-operated devices shall have an indicating element that return to zero.  Yes  No  N/A
- 7.35. Does the device have:
  - 7.35.1. A cumulative indicating element?  Yes  No  N/A
  - 7.35.2. A cumulative recording element?  Yes  No  N/A
- 7.36. Primary indicating and recording elements shall not go beyond their correct zero position.  Yes  No  N/A

**Code Reference: S.1.6.4.1. Display of Unit Price**

A computing or money-operated device shall have a means on the face of the device for displaying the unit price at which it is set to compute or deliver. If a grade, brand, blend, or mixture is offered for sale at more than one unit price from a device, then all of the unit prices at which that product is offered for sale shall be displayed or shall be capable of being displayed on the dispenser using controls available to the customer prior to the delivery of the product. The unit price shall be expressed as a decimal value in dollars.

- 7.37. Means shall be provided to display the unit price on the face of the device.  Yes  No  N/A
- 7.38. If a grade, brand, blend, or mixture is offered for sale at more than one unit price from a device, then all of the unit prices at which that product is offered for sale:
  - 7.38.1. Shall be displayed prior to the delivery of the product. **OR**  Yes  No  N/A
  - 7.38.2. Shall be capable of being displayed on the dispenser using controls available to the customer.  Yes  No  N/A

*Note: It is not necessary to simultaneously display all of the unit prices for all grades, brands, blends, or mixtures provided the dispenser complies with this section, S.1.6.4.1.*

The unit prices for each product and price level may be:

- a. Displayed simultaneously for all products.

- b. Displayed simultaneously for each product separately.; or
- c. Displayed individually in a unit-price display only if controls permit the customer to sequence the display through the unit prices for each and every product.

*Note: Section 7.38.2 shall not apply to fleet sales, other contract sales, or truck refueling sales (e.g. sales from dispensers used to refuel trucks.) and systems that offer post-delivery discountson fuel sales, provided the system complies with S.1.6.8.*

- 7.39. The unit price shall be expressed in dollars and decimals of dollars using a dollar sign. A common fraction shall not appear in the unit price, (e.g., \$1.299 not \$1.29 9/10).  Yes  No  N/A

**Code Reference: S.1.6.4.2. Display of Product Identity**

- 7.40. Means shall be provided to post the identity of the product grade, brand, blend, or mixture or dispensed product.  Yes  No  N/A

**Code Reference: S.1.6.5.5. Display of Quantity and Total Price**

- 7.41. Except for aviation refueling applications, when a delivery is completed on a computing device, the total price and quantity for that transaction shall be displayed on the face of the dispenser for at least 5 minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.  Yes  No  N/A

*Note: The displayed unit price may revert to a base unit price immediately after the completion of a transaction, defined as the time the delivery has been terminated and payment has been settled. Any display of quantity, unit price, and total price that does not mathematically agree occurs between transactions and is permitted (in response to demands of device users) because the displayed values between "transactions" are not "significant" relative to the actual delivery process (transaction.)*

**Code Reference: S.1.6.5.6. Display of Quantity and Total Price, Aviation Refueling Applications**

- 7.42. a. The quantity shall be displayed throughout the transaction.  Yes  No  N/A
- b. The total price shall also be displayed under one of the following conditions:
- i. The total price can appear on the face of the dispenser or through a controller adjacent to the device.
  - ii. If a device is designed to continuously calculate and display the total price, it shall be displayed for the quantity delivered throughout the transaction.
- c. The total price and quantity shall be displayed for at least 5 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.

## 8. Computing

A retail computing device shall be capable of computing total sale prices for all unit prices and for all deliveries within the range of measurement or computing capacity. The maximum value of the money-value division and the maximum variation of indicated total sale price from the mathematically computed total sale price are specified for analog devices. Because analog dispensers may have different money-value divisions depending upon the unit price, the service station console must update in the same money-value division to maintain agreement of total sale price values. The maximum quantity-value divisions for digital devices are prescribed.

**Code Reference: S.1.6.5. Money-Value Computations**

- 8.1. A retail computing device shall compute total sale prices for all quantities and unit prices within the range of its quantity and computing capacities.  Yes  No  N/A

*Notes: For dispensers which are not capable of complying with the requirements of UR.3.2., UR.3.3., and S.1.6.5., the Certificate of Conformance must be limited to single-tier pricing applications. This requirement does not apply to devices for which the Certificate of Conformance is limited to installations where the devices are used for fleet sales, other price contract sales, and truck stop dispensers used only to refuel trucks.*

- 8.2. Analog money value indications on each side of a device shall not differ from the mathematically computed money value (Quantity x Unit Price = Sales Price), for any delivered quantity, by an amount greater than the values shown in the following table:  Yes  No  N/A

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¢, 2¢ or 5¢	± 1¢ ± 2.5¢	± 2¢ ± 5¢

See NIST Handbook 44 N.4.3. for Test Procedures

- 8.3. Total prices indicated on the two sides of an analog register shall agree within one-half of the money value division.  Yes  No  N/A

**Code Reference: S.1.6.5.1. Analog Money-Value Divisions**

Analog money-value divisions shall be as follows:

- 8.4. Not more than 1 cent at all unit prices up to and including \$0.25 per liter or \$1.00 per gallon.  Yes  No  N/A
- 8.5. Not more than 2 cents at all unit prices greater than \$0.25 per liter or \$1.00 per gallon up to and including \$0.75 per liter or \$3.00 per gallon.  Yes  No  N/A
- 8.6. Not more than 5 cents at all unit prices greater than \$0.75 per liter or \$3.00 per gallon.  Yes  No  N/A

**Code Reference: S.1.6.5.2. Digital Money-Value Divisions**

- 8.7. Digital quantity and total price indications shall agree to the nearest cent.  Yes  No  N/A
- 8.8. Total price indications shall be based on quantity-value divisions that are less than or equal to 0.05 liters or 0.01 gallons.  Yes  No  N/A

**Code Reference: S.1.6.5.3. Money-Value Divisions, Auxiliary Indications**

- 8.9. Money value divisions on devices such as remote consoles and printers shall be the same as on the dispenser.  Yes  No  N/A

**Code Reference: S.1.6.5.4. Selection of Unit Price**

- 8.10. Except for dispensers used exclusively for truck refueling (e.g., truck stop dispensers used only to refuel trucks), when a product or grade is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made:
- 8.10.1. Prior to delivery using controls on the device. **OR**  Yes  No  N/A
- 8.10.2. **Through deliberate action of the purchaser using: 1) controls on the device; 2) personal or vehicle mounted electronic equipment communicating with the system; or 3) verbal instructions.** ~~Other customer-activated controls.~~  Yes  No  N/A

*Note: This requirement does not apply to devices for which the Certificate of Conformance is limited to installations where the devices are used exclusively for fleet sales, other price*

*contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks.) For systems that are only capable of applying a discount post-delivery, the final unit price may be selected before or after delivery, provided the system complies with S.1.6.8.*

8.11. A system shall not permit a change to the unit price during delivery of product.  Yes  No  N/A

**Code Reference: S.1.6.89. Travel of Indicator on Lubricant Devices**

8.12. If the most sensitive element of the indicating system of a lubricant device uses an indicator and graduations, the relative movement of these parts shall be at least 2.5 cm (1 in) per 0.5 L (1 pt) of delivery.  Yes  No  N/A

**9. Measuring Elements**

**Code Reference: S.2.2. Provision for Sealing**

Measuring elements shall be designed with adequate provisions to prevent changes from being made to the measuring element or the flow rate control (if the flow rate control affects the accuracy of deliveries) without evidence of the change being made. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.

- 9.1. A measuring element shall have provisions for either:
  - 9.1.1. Applying a physical security seal. **OR**  Yes  No  N/A
  - 9.1.2. An approved means of security (e.g., data change audit trail) so that no changes may be made to its adjustable components.  Yes  No  N/A
- 9.2. Any adjustable element controlling the delivery rate shall provide for sealing or other approved means of security (e.g., data audit trail) if the flow rate affects the accuracy of deliveries.  Yes  No  N/A
- 9.3. When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.  Yes  No  N/A
- 9.4. Audit trails shall use the format set forth in the Common and General Code Criteria section of this checklist (Code Reference G-S.8) and in Appendix A, Audit Trail Checklist for Liquid Measuring Devices.  Yes  No  N/A
- 9.5. Retail motor fuel dispensers with remote configuration capabilities shall be sealed according to Table S.2.2. in Appendix A, Minimum Requirements for Audit Trails for Liquid Measuring Devices and under the "Common and General Code Criteria" section of this checklist.  Yes  No  N/A

**Code Reference: S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing**

9.6. A change to the adjustment of any measuring element shall be individually identified.  Yes  No  N/A

*Note: Examples of acceptable identification of a change to the adjustment of a measuring element include but are not limited to:*

- a. A broken, missing, or replaced physical seal on an individual measuring element.
- b. A change in a calibration factor for each measuring element.
- c. Display of the date of or the number of days since the last calibration event for each measuring element.
- d. A counter indicating the number of calibration events per measuring element.

*Note: S.2.2.1. will be removed in the 2010 edition of NIST Handbook 44 when General Code paragraph G S.8.1. Multiple Weighing or Measuring Elements with a Single Provision for Sealing becomes effective.*

**Code Reference: S.2.3. Directional Flow Valves**

- 9.7. Values intended to prevent the reversal of flow shall be automatic in operation.  Yes  No  N/A

**Code Reference: S.2.4. Stop Mechanism**

If a device is hand-operated via a crank, the device is likely to have "stops" or tabs designed to stop the cranking operation at the point representing the nominal quantity to be delivered in one cycle. The stops must be held securely in place and marked with the nominal quantity represented by one cycle of the cranking process.

- 9.8. Stops must be held securely in position.  Yes  No  N/A
- 9.9. Each stop shall be marked with the nominal quantity to be delivered by cranking to each stop.  Yes  No  N/A
- 9.10. Stops shall be adjustable so deliveries will be within tolerance.  Yes  No  N/A

**Code Reference: S.2.5. Zero-Set-Back Interlock**

The zero-set-back interlock on a dispenser is critical to prevent fraudulent practices. A retail motor fuel device shall have an effective automatic interlock such that once the dispenser shuts off, it cannot be restarted without resetting the indicating element to zero. This requirement also applies to the recording element if one is present. The dispenser shall be designed so that the starting lever must be in the shut-off position and the interlock engaged before the discharge nozzle can be returned to its designed hanging position. If a single pump supplies more than one dispenser, then each dispenser shall have an automatic control valve that prevents product from being delivered by a dispenser until its indications have been set to zero.

- 9.11. After the device is turned off by moving the lever that stops the flow, a subsequent delivery shall be prevented until the indicators (and recording element if present) have returned to their correct zero positions.  Yes  No  N/A
- 9.12. The starting lever shall be in shut off position and zero-set-back interlock engaged before the nozzle can 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.  Yes  No  N/A
- 9.13. If more than one dispenser is connected to a single pump, an automatic control valve shall prevent fuel from being delivered until the indicating elements have been returned to their correct zero position and engaged.  Yes  No  N/A
- 9.14. The use of the interlock shall be effective under all conditions when any control on the console, except a system emergency shut-off, is operating and after any momentary power failure.  Yes  No  N/A

**Code Reference: S.2.8. Lubricant Devices, Supply Exhaustion**

A lubricant device that is not a meter type shall become inoperable or give a conspicuous and distinct warning when the level of the supply of lubricant becomes so low that it may affect the accuracy of the measurement.

**10. Discharge Lines and Discharge Line Valves**

**Code Reference: S.3.1. Diversion of Measured Liquid**

This paragraph does not apply to devices that comply with Paragraph S.3.2.

To prevent fraudulent practices, no means for which any measured liquid can be diverted from the measuring chamber or the discharge line of a device shall be available.

A device may have two or more delivery outlets if there are automatic means to insure that:

- a. Liquid can flow from only one outlet at a time. and

- b. The direction of liquid flow is definitely and conspicuously indicated.
- 10.1. Except as identified above, it shall not be possible to divert measured liquid from the measuring chamber or the discharge line of the device.  Yes  No  N/A
- 10.2. Two or more delivery outlets may be installed if there are automatic means to ensure that liquid can flow from only one outlet at a time, and the direction of flow for which the mechanism may be set at any time is definitely and conspicuously indicated.  Yes  No  N/A
- 10.3. Except as identified above, 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.  Yes  No  N/A

**Code Reference: S.3.2. Exceptions**

If suitable means are provided to prevent the diversion of liquid flow to other than the receiving vehicle, devices that are specifically installed for fueling trucks are exempt from the provisions of S.3.1. and may have two outlets operating simultaneously.

- 10.4. For devices that are specifically installed for fueling trucks, two outlets may be operated simultaneously only if suitable means are provided to ensure that diversion of flow to other than the receiving vehicle cannot readily be accomplished and is readily apparent. Such means include, but are not limited to, physical barriers to adjacent driveways, visible valves or lighting systems indicating which outlets are in operation, and explanatory signs.  Yes  No  N/A

**Code Reference: S.3.3. Pump-Discharge Unit**

- 10.5. If a pump-discharge unit is equipped with a flexible discharge hose, it shall be a wet-hose type.  Yes  No  N/A

**Code Reference: S.3.5. Discharge Hose**

- 10.6. A discharge hose shall be adequately reinforced.  Yes  No  N/A

**Code Reference: S.3.6. Discharge Valve**

- 10.7. A discharge valve may be installed in the discharge line only if the device is of the wet-hose type.  Yes  No  N/A

**Code Reference: S.3.7. Antidrain Valve**

- 10.8. A wet-hose, pressure-type device shall have an effective anti-drain valve incorporated in the discharge valve or adjacent thereto.  Yes  No  N/A

**11. Marking****Code Reference: S.4.1.1. Marking Requirements; Limitation on Use**

- 11.1. If a device is intended to accurately measure only products having particular properties or under specific installation or operating conditions or when used in conjunction with specific accessory equipment, these limitations shall be clearly and permanently stated on the device. A meter may be used to measure both gasoline and diesel fuel at different times provided the meter is tested and adjusted with the product to be measured before it is used commercially.  Yes  No  N/A

**Code Reference: S.4.4. Marking Requirements For Retail Devices Only**

- 11.2. On a retail device with a designed maximum discharge rate of 115 L/min (30 gpm) or greater, the maximum and minimum discharge rates shall be marked in accordance with *NIST Handbook 44* S.4.4.2. The minimum rate shall not exceed 20% of the maximum discharge rate.  Yes  No  N/A

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.

**Code Reference: S.4.4.2. Location of Marking Information**

11.3. The required marking information in the General Code, paragraph G-S.1. shall be located as follows:

- 11.3.1. Shall be within 24 to 60 inches from the base of the dispenser.  Yes  No  N/A
- 11.3.2. May be internal and/or external provided the information is permanent and easily read.  Yes  No  N/A
- 11.3.3. ~~Shall~~ **Shall** be on a portion of the device that cannot be readily removed or interchanged ( e.g., not on a service access panel.)  Yes  No  N/A

*Note: The use of a dispenser key or tool to access internal marking information is permitted.*

**12. Totalizers**

**Code Reference: S.5.1. Totalizers for Retail Motor Fuel Dispensers**

- 12.1. Retail motor fuel dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device.  Yes  No  N/A

**13. User Requirements**

**Code Reference: UR.1.1. Length of Discharge Hose**

- 13.1. The length of a discharge hose shall not exceed 5.5 m (18 ft), but marinas and airports may have hoses up to 15 m (50 ft) long.  Yes  No  N/A
- 13.2. If the length of a discharge hose in a marina or airport exceeds 8 m (26 ft), it shall be adequately protected from environmental factors.  Yes  No  N/A

**Code Reference: UR.3. Use of Device**

*Note: For dispensers which are not capable of complying with the requirements of UR.3.2., UR.3.3., and S.1.6.5., the Certificate of Conformance must be limited to single-tier pricing applications.*

**14. Installation Requirements**

**Code Reference: UR.2.1. Installation**

- 14.1. A device shall be installed according to the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.  Yes  No  N/A

**Code Reference: UR.2.2. Discharge Rate**

- 14.2. Actual maximum discharge rate shall not exceed the rated maximum discharge rate.  Yes  No  N/A

**15. Card-Activated Retail Motor Fuel Dispensers**

**Code Reference: G-S.2. Facilitation of Fraud**

Accidental or intentional fraud causes great concern when customers use card-activated systems in service stations, bank-card-activated systems directly access bank accounts. The following criteria and test procedures apply to card-activated retail motor fuel dispensers.

A card-activated system shall authorize the dispensing of product for not more than three minutes for the time between authorization and "handle on" at the dispenser. It shall properly record transactions on the appropriate card account.

When a card-activated system is subjected to power loss of greater than 10 seconds, the dispenser shall de-authorize. Because systems may be installed with separate power lines to the console, card reader, and dispenser, tests should be run with power failures to different parts of the system to evaluate the potential for accidental or intentional errors. The appropriate device response depends when the power loss occurs during the delivery sequence.

- 15.1. The dispenser must de-authorize in not more than three minutes if the pump "handle" is not turned on.  Yes  No  N/A
- 15.2. If the time limit to deactivate a dispenser is programmable, it shall not accept an entry greater than three minutes.  Yes  No  N/A
- 15.3. When a power loss greater than 10 seconds occurs after the pump "handle" is on, the dispenser must de-authorize.  Yes  No  N/A
- 15.4. When there is a loss of power, but the pump "handle" is not on, the dispenser must de-authorize in not more than three minutes.  Yes  No  N/A

**16. Test Methods for Card-Activated Retail Motor Fuel Dispensers**

- 16.1. Authorize the dispenser and, with the pump "handle" on, interrupt power to any part (or all) of the system. The pump should deauthorize immediately. Specifically:
  - 16.1.1. Authorize with a card and turn the "handle" on. Power down briefly, then restore power. Try to dispense product: the dispenser must not dispense because the power failure should have de-authorized the dispenser.  Yes  No  N/A
- 16.2. Authorize the dispenser using a card (leaving handle off); wait more than three minutes, and try to start the dispenser. It should not start because the authorization should have timed out. Specifically:
  - 16.2.1. Authorize with a card, but do not turn the "handle" on. Power down for more than three minutes, and then restore power. Try to dispense product; the dispenser should have "timed-out" and not dispense.  Yes  No  N/A
  - 16.2.2. Authorize and dispense with card #1. Allow the system to time out and de-authorize (if it does). Do not turn off the "handle." Authorize and dispense with card #2. The transactions shall be properly recorded for each card.  Yes  No  N/A

*Note: A mechanical register may accumulate the two deliveries, but the printed record must not have accumulated values.*

- 16.2.3. Authorize with card #1. Turn the "handle" on, then off. Authorize with card #2. Dispense product and complete the delivery. Check the printed receipt to verify that the delivery has been properly charged to card #2.  Yes  No  N/A
- 16.2.4. Turn the dispenser "handle" on, and use a card to authorize the dispenser. Turn the "handle" off. After a period of 15 seconds, turn the "handle" on. Try to deliver product; the dispenser must not dispense.  Yes  No  N/A
- 16.2.5. Authorize with card #1 (do not turn the "handle" on) and interrupt power for at least 10 seconds. This should de-authorize the dispenser. Resupply power; turn the "handle" on; try to dispense. The dispenser shall not deliver product.  Yes  No  N/A

*Note: The term "handle" generically refers to the handle, flapper, start button, on/off switch, or other mechanism used to activate or deactivate the dispenser.*

- 16.2.6. Authorize with card #1; turn the "handle" on, and then interrupt power. This should de-authorize the dispenser. Resupply power and authorize the dispenser with card #2. Then, complete a delivery. Verify that the transaction is charged to card #2.  Yes  No  N/A

*Note: This test is not required if the device under test complies with paragraph 16.1.*

- 16.2.7. Authorize a dispenser with card #1, but do not turn the dispenser "handle" on. Try to authorize the same dispenser with card #2; it should not be accepted until after the 3 minute time-out.  Yes  No  N/A
- 16.3. Attempt to override or confuse the card system by varying the length of time the card is in the slot, (e.g., vary the "swipe" times) and pushing all other keys on the keypad during each step of the authorization process.  Yes  No  N/A

