



Measuring Devices

Hydrocarbon Gas-Vapor Measuring Devices

Technical Policy • Checklists • Test Procedures



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Hydrocarbon Gas-Vapor Measuring Devices

Hydrocarbon Gas-Vapor Measuring Devices Checklist and Test Procedures

Introduction

The checklist is designed so that the user can determine and record in a logical sequence the conformance of the device with the elements of the checklist. The user should make copies of the checklist to serve as worksheets and preserve the original for reference. Unless specifically requested to do so, the applicant is not required to submit a completed checklist to NTEP prior to the evaluation; however, the applicant is urged to carefully review the checklist prior to submission to ensure that the device meets the requirements of the checklist. In most cases, the results of evaluation for each element can be recorded by checking the appropriate response. In some cases, the user is required to record values, results, or comments. In those cases, space is provided; examples are:

1. **Yes** **No** **N/A**
2. EXTERNAL INTERNAL N/A
3. Comments:

This checklist is a guide for conducting prototype examinations to determine compliance with the requirements of NIST Handbook 44. These criteria shall apply only to type evaluation examinations, not on a retroactive basis to devices that are currently in service. The General Code requirements apply to all classes of devices. The specific code requirements supersede General Code requirements in all cases of conflict.

1. General

Code Reference: G-S.1. Identification

Virtually all weighing and measuring equipment must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. Dispensers, consoles, cash registers interfaced with dispensers, retrofit computing registers, and customer card-activated terminals must all have these markings. As a practical matter, some equipment does not need a serial number. "Satellite" modules in a modular system (e.g., keyboard module and cash drawer) need not have serial numbers because they do not have any "intelligence."

A serial number is required in the following circumstances:

Separate Device: A device is capable of operating as a weighing or measuring device without being interfaced with or connected to other components.

Separate Main Element: Primary indicating elements must be marked. The device is a major element in the weighing or measuring system. That is, it is metrologically significant to the operation and/or performance of the system and interfaces with different compatible main elements. Examples: Indicating elements, weighing elements, meter registers, meter measuring elements (vehicle tank meters and loading rack meters).

Component: The device is a component in a system, may be used in different models of devices, and is sufficiently complex to warrant a separate evaluation and a separate CC (e.g., load cells and vapor recovery nozzles). Such a device may or may not be placed into an enclosure with other components of the system. When installed in an enclosure, the complete device must be marked with a serial number, and the one serial number will suffice for the entire collection of components. If it is not placed in an enclosure with other components, the component must be marked with a serial number.

Equipment must be marked on a surface that is an integral part of the device, and the marking must be visible after installation. If the required information is not positioned in a visible location after installation, a duplicate, permanent identification badge must be located in a visible location. A removable cover is an acceptable location for the required information only if a permanent ID badge is located elsewhere on the device.

The information may be on a metal or plastic plate that is attached with pop rivets, adhesive, or other means, but may not be fastened by removable bolts or screws. A foil or vinyl badge may be used provided that the badge can survive wear and tear, remains legible, and is difficult to remove. The printing on a foil badge must be easily readable and not easily obliterated by rubbing with a relatively soft object (e.g., the wood of a pencil)

Location of the information:

1. Identification

All equipment shall be clearly and permanently marked on an exterior visible surface after installation. It must contain the following information (prefix lettering may be initial capitals, all capitals, or all lower case):

Code Reference: G-S.1.

- 1.1. Name, initials, or trademark of the manufacturer. Yes No N/A
- 1.2. A model designation that positively identifies the pattern or design. The Model designation shall be prefaced by the word "Model", "Type", or "Pattern". These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, at a minimum, begin with the letter "N" (e.g., No or No.) The abbreviation for the word "Model" shall be "Mod" or "Mod.". Yes No N/A
- 1.3. Except for not built-for-purpose, software-based devices, a nonrepetitive serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number. 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.). Yes No N/A
- 1.4. For not built-for-purpose, software-based devices the current software version or revision designation. The version or revision identifier shall be prefaced by the word "Version" or "Revision" as appropriate and either word may be followed by the word "Number." The abbreviations for the word "Version" shall, as a minimum, begin with the letter "V". The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). Yes No N/A

Code Reference: G-S.1. (e).

- 1.5. The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have a CC. The number shall be prefaced by the terms "NTEP CC", "CC", or "Approval". These terms may be followed by the word "Number" or an abbreviation for the Word "Number". The abbreviation shall as a minimum begin with the letter "N" (e.g., No or No.). Yes No N/A

The device must have an area, either on the identification plate or on the device itself, suitable for the application of the Certificate of Conformance Number. If the area for the CC Number is not part of an identification plate, then note its intended location below and how it will be applied.

Location of CC Number if not located with the identification:

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

- 1.6. For not built-for-purpose, software-based devices the following shall apply:
- 1.6.1. The required information in G-S.1 Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or Yes No N/A

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

Note: For (1.6.2.), 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.

- 1.7. The identification badge must be visible after installation. Yes No N/A
- 1.8. The identification badge must be permanent. Yes No N/A

Code Reference: S.4.1. Marking Requirements – Limitation of Use

- 1.9. If a device is intended to measure accurately only products having particular properties, or to measure accurately only under specific installation or operating conditions, or to measure accurately when used in conjunction with specific accessory equipment, these limitations shall be clearly and permanently marked on the device. Yes No N/A

Code Reference: S.4.2. Marking Requirements -Discharge Rate

- 1.10. A volume-measuring device shall be marked to show it's rated gas capacity in cubic meters or cubic feet per hour. Yes No N/A

Code Reference: S.4.3. Temperature Compensation

- 1.11. If a device is equipped with a temperature compensator, this shall be marked on the badge or immediately adjacent to the badge and on the register. Yes No N/A

Code Reference: S.4.4. Badge

- 1.12. A badge affixed in a prominent position on the front of the device shall show the manufacturer's name, serial number and model number of the device, and capacity rate of the device for the particular products that it was designed to meter as recommended by the manufacturer. Yes No N/A

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

This applies to all metering systems, including dispensers controlled from a remote location and vehicle tank meters. An exception is permitted if the unit price can be changed at a dispenser only through the use of a key to gain access to the unit price mechanism, e.g., mechanical computing registers. Such action would be obvious to a consumer and would inhibit changing the unit price during a delivery.

- 1.13. 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. Yes No N/A

Code Reference: G-S.3. Permanence

Equipment shall be of such materials, design, and construction that, under normal service conditions:

- 1.14. Accuracy will be maintained. Yes No N/A
- 1.15. Operating parts will continue to function as intended, Yes No N/A
- 1.16. Adjustments will remain reasonably permanent. Yes No N/A

Code Reference: G-S.4. Interchange or Reversal of Parts

If a metering system has parts that may be interchanged or reversed in normal field assembly, the system shall either be constructed so that reversal will not affect the accuracy of the system or the parts must be marked to indicate their proper position. For most metering devices, this applies only to the reversal of connectors of cables to peripheral devices.

If a metering system has any parts that may be interchanged or reversed in normal field assembly, the parts must either be:

- 1.17. Constructed so that reversal will not affect performance, Yes No N/A
- 1.18. Marked or keyed to indicate the proper position. Yes No N/A

2. Graduations, Indications, and Recorded Representations

Several general requirements facilitate the reading and interpretation of displayed and recorded values. Each display for quantity must be appropriate in design and have sufficient capacity for particular applications to be suitable for the application. Metering devices must be capable of indicating the maximum quantity that can normally be expected in a particular application.

Code Reference: S.1.1. Primary Elements

- 2.1. **General.** -A device shall be equipped with a primary indicating element and may also be equipped with a primary recording element. Yes No N/A
- 2.2. **Units.** - A volume-measuring device shall indicate, and record if equipped to record, its deliveries in terms of cubic meters or cubic feet, or multiple or decimal subdivisions of cubic meters or cubic feet. Yes No N/A

Code Reference: S.1.1.3. Value of the Smallest Unit – Volume Measuring Devices

- 2.3. The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed:
- 2.3.1. (a) 1 m^3 ($1\,000 \text{ dm}^3$) (100 ft^3) when the maximum rated gas capacity is less than $100 \text{ m}^3/\text{h}$ ($10\,000 \text{ ft}^3/\text{h}$); Yes No N/A
- 2.3.2. (b) 10 m^3 ($1\,000 \text{ ft}^3$) when the maximum rated gas capacity is $280 \text{ m}^3/\text{h}$ ($10\,000 \text{ ft}^3/\text{h}$) up to but not including $1\,700 \text{ m}^3/\text{h}$ ($60\,000 \text{ ft}^3/\text{h}$); Yes No N/A
- 2.3.3. (c) 100 m^3 ($10\,000 \text{ ft}^3$) when the maximum rated gas capacity is $1\,700 \text{ m}^3/\text{h}$ ($60\,000 \text{ ft}^3/\text{h}$) or more. Yes No N/A

Code Reference: S.1.1.4.

- 2.4. Primary indicating and recording elements shall advance digitally or continuously and be susceptible to advancement only by the mechanical operation of the device. Yes No N/A

Code Reference: S.1.1.5. Proving Indicator

- 2.5. Devices rated less than $280 \text{ m}^3/\text{h}$ ($10\,000 \text{ ft}^3/\text{h}$) gas capacity shall be equipped with a proving indicator measuring 0.025 , 0.05 , 0.1 , 0.2 , or 0.25 m^3 per revolution (1 , 2 , 5 , or 10 ft^3 per revolution) for testing the meter. Devices with larger capacities shall be equipped as follows:
- 2.5.1. (a) Devices rated 280 m^3 ($10\,000 \text{ ft}^3$) up to but not including $1\,700 \text{ m}^3/\text{h}$ ($60\,000 \text{ ft}^3/\text{h}$) gas capacity shall be equipped with a proving indicator measuring not greater than 1 m^3 (100 ft^3) per revolution. Yes No N/A
- 2.5.2. (b) Devices rated $1\,700 \text{ m}^3/\text{h}$ ($60\,000 \text{ ft}^3/\text{h}$) gas capacity or more shall be equipped with a proving indicator measuring not more than 10 m^3 ($1\,000 \text{ ft}^3$) per revolution. Yes No N/A
- 2.5.3. The test circle of the proving indicator shall be divided into 10 equal parts. Additional subdivisions of one or more of such equal parts may be made. Yes No N/A

Code Reference: S.1.2. Graduations

- 2.6. **Length.** - Graduations shall be so varied in length that they may be conveniently read. Yes No N/A
- 2.7. **Width.** - In any series of graduations, the width of a graduation shall in no case be greater than the width of the minimum clear interval between graduations, and in no case should it exceed 1.0 mm (0.04 in) for indicating elements and 0.5 mm (0.02 in) for proving circles. Yes No N/A

Code Reference: S.1.2.3. Clear Interval Between Graduations

- 2.8. The clear interval shall be not less than 1.0 mm (0.04 in). If the graduations are not parallel, the measurement shall be made: Yes No N/A
 - 2.8.1. (a) along the line of relative movement between the graduations at the end of the indicator, or Yes No N/A
 - 2.8.2. (b) if the indicator is continuous, at the point of widest separation of the graduations. Yes No N/A

Code Reference S.1.3. Indicators

- 2.9. **Symmetry.** - The index of an indicator shall be symmetrical with respect to the graduations, at least throughout that portion of its length associated with the graduations. Yes No N/A
- 2.10. **Length.** - The index of an indicator shall reach to the finest graduations with which it is used. Yes No N/A

Code Reference: S.1.3.3. Indicator Width

- 2.11. The width of the index of an indicator in relation to the series of graduations with which it is used shall be not greater than:
 - 2.11.1. (a) the width of the widest graduation, and Yes No N/A
 - 2.11.2. (b) the width of the minimum clear interval between graduations. Yes No N/A
 - 2.11.3. When the index of an indicator extends along the entire length of a graduation, that portion of the index of the indicator that may be brought into coincidence with the graduation shall be of the same width throughout the length of the index that coincides with the graduation Yes No N/A
- 2.12. **Clearance.** - The clearance between the index of an indicator and the graduations shall in no case be more than 1.5 mm (0.06 in). Yes No N/A
- 2.13. **Parallax.** - Parallax effects shall be reduced to the practicable minimum. Yes No N/A

3. Code Reference: S.2. Design of Measuring Elements

Code Reference: S.2.1. Pressure Regulation

- 3.1. Except when measured as a retail motor fuel, the vapor should be measured at a normal gauge pressure (psig) of:
- 3.1.1. (a) $2\,740\text{ Pa} \pm 685\text{ Pa}$ [11 in of water column (0.40 psig) \pm 2.75 in of water column (0.10 psig)] for liquefied petroleum gas vapor; or Yes No N/A
- 3.1.2. (b) $1\,744\text{ Pa} \pm 436\text{ Pa}$ [7 in of water column (0.25 psig) \pm 1.75 in of water column (0.06 psig)] for natural and manufactured gas. Yes No N/A

When vapor is measured at a pressure other than what is specified above for the specific product, a volume multiplier shall be applied within the meter or to the billing invoice based on the following equation:

Where

VPM = Volume pressure multiplier
 AAP = Assumed atmospheric pressure in psia
 GP = Gauge pressure in pascal or psig
 NGP = Normal gauge pressure in pascal or psig

The assumed atmospheric pressure is to be taken from HB 44 Sec 3.33. Tables 2 and 2M

- 3.1.3. When liquefied petroleum gas vapor is measured at a pressure of 6 900 Pa (1 psig) or more, the delivery pressure shall be maintained within $\pm 1\,725\text{ Pa}$ ($\pm 0.25\text{ psig}$). Yes No N/A
- 3.1.4. Pressure variations due to regulator lock off shall not increase the operating pressure by more than 25%. Yes No N/A
- 3.2. **Provision for Sealing.** - Adequate provision shall be made for applying security seals in such a manner that no adjustment may be made of any measurement element. Yes No N/A
- 3.3. **Maintenance of Vapor State.** - A device shall be so designed and installed that the product being measured will remain in a vapor state during passage through the meter. Yes No N/A
- 3.4. **Automatic Temperature Compensation.** - A device may be equipped with an adjustable automatic means for adjusting the indication and registration of the measured volume of vapor to the volume at 15 °C (60 °F). Yes No N/A

4. Design of Discharge Lines

Code Reference S.3.

- 4.1 **Diversion of Measured Vapor.** - No means shall be provided by which any measured vapor can be diverted from the measuring chamber of the meter or the discharge line therefrom. Yes No N/A

5. Repeatability of Indications

Code Reference: G-S.5.4.

The quantity measured by a device shall be repeatable within tolerance for the same indication. One condition that may create a problem is that the value of the quantity division may be large relative to the tolerance. A delivery must be within tolerance wherever the delivery is stopped within the nominal indication of the test draft. Meters that may be at the tolerance limit may be out of tolerance at an extreme limit of the nominal quantity indication.

- 5.1. When a digital indicator is tested, the delivered quantity shall be within tolerance at any point within the quantity-value division for the test draft. Yes No N/A

The following philosophy and list of sealable parameters applies to provision for sealing all liquid/vapor-measuring devices.

An electronic data audit trail is a means of allowing a weights and measures inspector to review how many times any electronic adjustment, which affects the accuracy of a weight, or volume measurement has been changed. The information contained in the audit trail shall consist of a cumulative and non-destructible number (even if a power failure occurs) which increments each time any of the adjustments required to be sealed have been changed. The electronic data audit trail information shall be capable of being recalled by the official on the main display of the device.

As a minimum, devices which use an audit trail to provide security for sealable parameters shall satisfy the following criteria and shall use the format set forth in Appendix A of the checklist for Liquid-Measuring Devices.

Philosophy for Sealing Typical Features to be Sealed

Principles for Determining Features to be Sealed

The need to seal some features depends upon:

- The ease with which the feature or the selection of the feature can be used to facilitate fraud; and
- The likelihood that the use of the feature will result in fraud not being detected.

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

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

If individual device characteristics are selectable from a "menu" or a series of programming steps, then access to the "programming mode" must be sealable. (Note: If an audit trail is the only means of security, then the audit trail shall update only after at least one sealable parameter has been changed; simply accessing the sealable parameters via a menu shall not update the audit trail.)

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

Typical Features and Parameters to be Sealed

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

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

1. Measuring element adjustments where linearity corrections are used, e.g., flow rate 1 and meter factor 1, flow rate 2 and meter factor 2, etc.
2. Mass flow meter adjustments for zero adjustments (not simply setting the display to zero) and span settings.

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

1. Octane or other blend setting ratios (optional in Canada at this time)
2. Temperature, pressure, density, and other sensor settings for zero, span, and offset values
3. Measurement units (in Canada, only if not displayed or printed on the primary register)
4. Temperature compensation table, liquid coefficient of expansion, or compressibility factors or tables
5. Liquid density setting (in Canada, only if not displayed or printed on the primary register) and allowable liquid density input range
6. Vapor pressures of liquids if used in calculations to establish the quantity
7. Meter or sensor temperature compensation factors
8. False or missing pulse limits for dual pulse systems (Canada only)
9. On/off status of automatic temperature, pressure, or density correction
10. Automatic or manual data input for sensors
11. Dual pulse checking feature status on or off
12. Flow control settings (optional in Canada)
13. Filtering constants

Hydrocarbon Gas-Vapor Measuring Device Features and Parameters	
Typical Features or Parameters to be Sealed	Typical Features or Parameters Not Required to be Sealed
Measuring element adjustment (both mechanical and electronic)	Analog-to-digital converters
Linearity correction values	Quantity division value (display resolution)
Measurement units (e.g., cubic feet to cubic meters)	Double pulse counting
Octane blend setting for retail motor fuel dispensers	Communications
Any tables or settings accessed by the software or manually entered to establish the quantity (e.g., specific gravity, pressure, etc.)	
Density ranges	
Pulsers	
Signal pick-up (magnetic or reluctance)	
Temperature probes and temperature offsets in software	
Pressure and density sensors and transducers	
Flow control settings, e.g., flow rates for slow-flow start, quantity for slow-flow start and stop	
Temperature compensating systems (on/off)	
Differential pressure valves	
As a point of clarification, the flow control settings referenced above are those controls typically incorporated into the installations of large-capacity meters (wholesale meters). The reference does not include the point at which retail motor-fuel dispensers slow product flow during a prepaid transaction to enable the dispenser to stop at the preset amount.	

Note: The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive. Some parameters other than those listed, which affect the metrological performance of the device, must be sealed. If listed parameters or other parameters, which may affect the metrological function of the device, are not sealed, the manufacturer must demonstrate that all settings comply with the most stringent requirements for the application of the device (i.e., the parameter does not affect compliance with Handbook 44).

(Section 3.33. of Handbook 44, Code for Hydrocarbon Gas Vapor-Measuring Devices, does not include specific design criteria for electronic audit trails. Based upon G-A.3., Special and Unclassified Equipment, and G-S.8., Provisions for Sealing Electronic Adjustable Components, Table S.2.2.of the Liquid-Measuring Devices Code, Categories of Device and Methods of Sealing, will be applied to the type evaluation of cryogenic devices until specific design criteria are added to Section 3.33. of Handbook 44 for the design of audit trails installed in Hydrocarbon Gas Vapor-measuring devices.)

Category 1 Devices (Devices with No Remote Configuration Capability):

- The device is sealed with a physical seal or it has an audit trail with two event counters (one for calibration, the second for configuration). Yes No N/A
- A physical seal must be applied without exposing electronics. Yes No N/A
- Event counters are non-resettable and have a capacity of at least 000 to 999. Yes No N/A
- Event counters increment appropriately. Yes No N/A
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. Yes No N/A
- Accessing the audit trail information for review shall be separate from the calibration mode. Yes No N/A
- Accessing the audit trail information must not affect the normal operation of the device. Yes No N/A
- Accessing the audit trail information shall not require removal of any additional parts other than normal requirements to inspect the integrity of a physical security seal. (e.g., a key to open a locked panel may be required). Yes No N/A

Category 2 Devices (Devices with Remote Configuration Capability but Controlled by Hardware):

- The physical hardware enabling access for remote communication must be on-site. Yes No N/A
- The physical hardware must be sealable with a security seal or Yes No N/A
- The device must be equipped with at least two event counters: one for calibration, the second for configuration parameters Yes No N/A
 - calibration parameters event counter
 - configuration parameters event counter
- Adequate provision must be made to apply a physical seal without exposing electronics. Yes No N/A
- Event counters are non-resettable and have a capacity of at least 000 to 999. Yes No N/A
- Event counters increment appropriately. Yes No N/A
- Event counters may be located either: Yes No N/A
 - at the individual measuring device or
 - at the system controller
- If the counters are located at 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. Yes No N/A
- An adequate number (see table below) of event counters must be available to monitor the calibration and configuration parameters of each individual device. Yes No N/A
- The device must either: Yes No N/A
 - clearly indicate when it is in the remote configuration mode or
 - the device shall not operate while in the remote configuration mode.
- If capable of printing in the calibration mode, it must print a message that it is in the calibration mode. Yes No N/A
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. Yes No N/A
- The audit trail information must be readily accessible and easily read. Yes No N/A

Minimum Number of Counters Required		
	Minimum Counters Required for Devices Equipped with Event Counters	Minimum Event Counter(s) at System Controller
Only one type of parameter accessible (calibration or configuration)	One (1) event counter	One (1) event counter for each separately controlled device, or one (1) event counter, if changes are made simultaneously.
Both calibration and configuration parameters accessible	Two (2) event counters	Two (2) event counters for each separately controlled device, or two (2) or more event counters if changes are made to all controlled devices simultaneously.

Category 3 Devices (Devices with Unlimited Remote Configuration Capability):

Category 3 devices have virtually unlimited access to sealable parameters or access is controlled though a password.

- For devices manufactured after January 1, 2001, the device must either: Yes No N/A
 - Clearly indicate when it is in the remote configuration mode, or
 - The device shall not operate while in the remote configuration mode
- The device is equipped with an event logger Yes No N/A
- The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter. Yes No N/A
- Event counters are nonresettable and have a capacity of at least 000 to 999. Yes No N/A
- The system is designed to attach a printer, which can print the contents of the audit trail. Yes No N/A
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. Yes No N/A
- The event logger must have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. Yes No N/A
- The event logger drops the oldest event when the memory capacity is full and a new entry is saved. Yes No N/A
- Describe the method used to seal the device or access the audit trail information.

Code Reference: G-UR.1.1. Suitability of Equipment

A device must be properly designed and have sufficient capacity to be suitable to use in a particular application. A device must measure the appropriate characteristics of a commodity to accurately determine the quantity, have the necessary components (e.g. vapor eliminator) to eliminate factors that may cause measurement errors during normal use, have sufficient capacity to indicate the quantity measured and the associated total price if it is a computing device. The meter must have the proper flow rate capacity to operate over the actual flow rates for the application, and the device must have a quantity division appropriate for the application. Some specific requirements for device characteristics are given in the specific codes for particular devices.

2.25. The equipment is suitable for its intended application. Yes No N/A

Code Reference: G-UR.1.2. Environment

2.26. Equipment shall be suitable for use in the environment in which it will be used. Suitability with respect to environment includes the effects of wind, weather, temperature variations, and radio frequency interference. A device must work and remain accurate under its actual conditions of use. Yes No N/A

Code Reference: G-UR.3.3. Position of Equipment

Paragraph G-UR.3.3. requires that the primary indicating element be visible from a reasonable customer position. Many electronic vehicle-mounted metering/controlling systems on which transaction information is displayed are mounted inside the cab of the delivery vehicle. This location is not considered visible from a reasonable customer position. Some systems provide a remote customer display as a standard feature and some do not. The application section of any Certificate of Conformance issued to a vehicle-mounted metering/controlling system must limit the system to installations where a customer indicator is provided and located in a reasonable customer position (e.g., at the meter on the rear of the vehicle).

A. Field Evaluation and Permanence Test for Hydrocarbon Gas Vapor Meters

The following tests are to be run on vapor meter as part of the permanence test:

1. Three tests at the maximum discharge rate.
2. Three slow-flow tests. (Refer to slow-flow tests below)
3. One low-flame test. (Refer to low-flame test below)

Only one meter will be required for the initial test, after which the meter must have air or product passed through it as part of the permanence test. The amount of air or product shall be at least the maximum flow rate times 1000. California weights and measures performs this test in approximately 60 days. Although it is longer than the usual 30-day test, this is considered appropriate because these meters are usually tested only every ten years.

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the certificate of conformance must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the certificate of conformance provided the results are within the acceptable tolerances.

B. Test Medium – The device shall be tested with air or the product to be measured.

C. Temperature and Volume Change - Care should be exercised to reduce to a minimum any volume changes. The temperature of the air, bell-prover oil, and the meters under test should be within 1 °C (2 °F) of one another. The devices should remain in the proving room for at least 16 hours before starting any proving operations to allow the device temperature to approximate the temperature of the proving device.

D. Test Drafts - Except for low-flame tests, test drafts shall be at least equal to one complete revolution of the largest capacity proving indicator, and shall in no case be less than 0.05 m³ or 2 ft³. All flow rates shall be controlled by suitable outlet orifices.

E. Test Procedures - If a device is equipped with an automatic temperature compensator, the proving device reading shall be corrected to 15 °C (60 °F), using an approved table.

F. Normal Tests - The normal test of a device shall be made at a rate not to exceed the capacity rate given on the badge of the meter.

G. Automatic Temperature Compensation - If a device is equipped with an automatic temperature compensator, the quantity of the test draft indication of the standard shall be corrected to 15°C (60 °F).

H. 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.

I. 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. shall be considered a special test.

J. Slow Test. - The device shall be tested at a rate not less than 20 percent of the marked capacity rate, or (at the check rate) not less than the minimum flow rate if marked on the device, whichever is less.

K. Low-Flame Test. - The device shall be tested at an extremely low-flow rate as given in HB 44 Sec 3.33.Table 1. The test shall consist of passing air at a pressure of 375 Pa (1.5 in water column) through the meter for not less than 60 minutes. The meter shall continue to advance at the conclusion of the test period.