

### Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices

Device Description: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Company: \_\_\_\_\_ Address: \_\_\_\_\_

E-mail: \_\_\_\_\_ City: \_\_\_\_\_

#### Instructions For Completing Pre-Evaluation Checklists

You will usually need to complete **both** the “General” checklist and the specific checklist which is most applicable to your device or system type. For example, for a weighing device or weighing system the “General” checklist (which applies to all device types) and the “Scales” checklist should be completed. Both the “General” and “Watt-hour Meter” checklists should be completed and submitted with an electric watt-hour metering system application.

The exceptions are the computer software/hardware component pre-evaluation checklists which have the “General” requirements incorporated in them. Use the checklist for computer systems connected with either scales or measuring systems. Only one pre-evaluation checklist will be needed unless the software will be connected to both types of systems.

These checklists include requirements extracted from the California Code of Regulations. Though not all-encompassing, the checklists contain requirements beyond those which would apply to any single device type or accessory. It is best to think of a device type as a weighing or measuring device system or as a component of such a system whichever best describes the device(s).

When applying the requirements to your device you have three options; Check

- YES** If your device or system complies
- NO** if the device or system does not comply.
- NA** if sections appear not to apply to the device or system type(s)

If selecting “**NO**”, consider if your device or system is ready for evaluation. If the deficiency is of such a nature that it will not effect the ability to test for accuracy, such as failure to conform with marking requirements or lack of provision for sealing, the evaluation can probably begin while deficiencies are being corrected.

*If you are not able to conduct accuracy testing your system or device is probably not yet ready for an evaluation.*

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I have reviewed the enclosed specifications, tolerances, and test notes for the device type for which we have applied for evaluation and approval. To the best of my knowledge I have determined the device meets all applicable requirements.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

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<p><b>A. Application.</b></p> <p><b>A.1.</b> This code applies to devices used for the measurement of liquefied petroleum gas and anhydrous ammonia in the liquid state, whether such devices are installed in a permanent location or mounted on a vehicle.</p> <p><b>A.2.</b> Insofar as they are clearly appropriate, the requirements and provisions of the code may be applied to devices used for the measurement of other liquids that do not remain in a liquid state at atmospheric pressures and temperatures.</p> <p><b>A.3.</b> See also General Code requirements.</p> <p><b>A.4.</b> This code does not apply to mass flow meters.</p>
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	Yes	No	NA
<p><b>S. Specifications.</b></p> <p><b>S.1. Design of Indicating and Recording Elements and of Recorded Representations.</b></p> <p><b>S.1.1. Primary Elements.</b></p> <p><b>S.1.1.1. General.</b> - A device shall be equipped with a primary indicating element and may also be equipped with a primary recording element.</p> <p>[Note: Vehicle-mounted metering systems shall be equipped with a ticket printer.]</p>			
<p><b>S.1.1.2. Units.</b> - A device shall indicate, and record if the device is equipped to record, its deliveries in terms of liters, gallons, quarts, pints, or binary-submultiple or decimal subdivisions of the liter or gallon.</p>			
<p><b>S.1.1.3. Value of Smallest Unit.</b> - 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:</p> <p>(a) 0.5 L (1 pt) on retail devices, or (b) 5 L (1 gal) on wholesale devices.</p>			
<p><b>S.1.1.4. Advancement of Indicating and Recording Elements.</b> - Primary indicating and recording elements shall be susceptible to advancement only by the mechanical operation of the device. However, a device may be cleared by advancing its elements to zero, but only if:</p> <p>(a) the advancing movement, once started, cannot be stopped until zero is reached, or (b) in the case of indicating elements only, such elements are automatically obscured until the elements reach the correct zero position.</p>			
<p><b>S.1.1.5. Money Values--Mathematical Agreement.</b> - Any digital money-value indication and any recorded money value on a computing-type device shall be in mathematical agreement with its associated quantity indication or representation to within one cent of money value; except that a stationary retail computing-type device must compute and indicate to the nearest 1 cent of money value.</p>			

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<p><b>S.1.1.6. Printed Ticket.</b> - Any printed ticket issued by a device of the computing type on which there is printed the total computed price, shall have printed clearly thereon the total volume of the delivery in terms of liters or gallons, and the appropriate decimal fraction of the liter or gallon, and the corresponding price per liter or gallon.</p>			
<p><b>S.1.2. Graduations.</b></p> <p><b>S.1.2.1. Length.</b> - Graduations shall be so varied in length that they may be conveniently read.</p>			
<p><b>S.1.2.2. Width.</b> - 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 the width of main graduations shall be not more than 50 percent greater than the width of subordinate graduations. Graduations shall in no case be less than 0.2 mm (0.008 in) width.</p>			
<p><b>S.1.2.3. Clear Interval Between Graduations.</b> - 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:</p> <p>(a) along the line of relative movement between the graduations at the end of the indicator; or (b) if the indicator is continuous, at the point of widest separation of the graduations.</p>			
<p><b>S.1.3. Indicators.</b></p> <p><b>S.1.3.1. Symmetry.</b> - 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.</p>			
<p><b>S.1.3.2. Length.</b> - The index of an indicator shall reach to the finest graduations with which it is used, unless the indicator and the graduations are in the same plane, in which case the distance between the end of the indicator and the ends of the graduations, measured along the line of graduations, shall be not more than 1.0 mm (0.04 in).</p>			
<p><b>S.1.3.3. Width.</b> - 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:</p> <p>(a) the width of the narrowest graduation, and (b) the width of the minimum clear interval between graduations.</p> <p>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.</p>			
<p><b>S.1.3.4. Clearance.</b> - The clearance between the index of an indicator and the graduations shall in no case be more than 1.5 mm (0.06 in).</p>			
<p><b>S.1.3.5. Parallax.</b> - Parallax effects shall be reduced to the practicable minimum.</p>			
<p><b>S.1.4. For Retail Devices Only.</b></p> <p><b>S.1.4.1. Indication of Delivery.</b> - A retail device shall be constructed to show automatically its initial zero condition and the amounts delivered up to the nominal capacity of the device.</p>			

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<p><b>S.1.4.2. Return to Zero.</b></p> <p>(a) Primary indicating elements shall be readily returnable to a definite zero indication.                      (b) Primary recording elements on a stationary retail device shall be readily returnable to a definite zero indication if the device is equipped to record.                      (c) Means shall be provided to prevent the return of primary indicating elements, and of primary recording elements if these are returnable to zero, beyond their correct zero position.</p>			
<p><b>S.1.5. For Stationary Retail Devices Only.</b></p> <p><b>S.1.5.1. Display of Unit Price and Product Identity.</b> - In a device of the computing type, means shall be provided for displaying on each face of the device the unit price at which the device is set to compute or to deliver as the case may be, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device.</p>			
<p><b>S.1.5.2. Money-Value Computations.</b> - A computing device shall compute the total sales price at any single-purchase unit price (excluding fleet sales and other price contract sales) for which the product 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. The analog money value indication 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 Table 1 (see page 9).</p>			
<p><b>S.1.5.2.1. Money-Value Divisions, Analog.</b> - The value of the graduated intervals representing money values on a computing-type device with analog indications shall be as follows:</p> <p>(a) Not more than 1 cent at all unit prices up to and including \$0.25 per liter or \$1.00 per gallon.                      (b) Not more than 2 cents at 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.                      (c) Not more than 5 cents at all unit prices greater than \$0.75 per liter or \$3.00 per gallon.</p>			
<p><b>S.1.5.2.2. Money-Value Divisions, Digital.</b> - 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 0.01 gallon intervals for devices indicating in inch-pound units and 0.05 liter for devices indicating in metric units.</p>			
<p><b>S.1.5.2.3. Money-Value Divisions, Auxiliary Indications.</b> - <i>In a system equipped with auxiliary indications, all indicated money-value divisions shall be identical.</i></p>			

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	Yes	No	NA
<p><b>S.1.6. For Wholesale Devices Only.</b></p> <p><b>S.1.6.1. Travel of Indicator.</b> - A wholesale device shall be readily operable to deliver accurately any quantity from 180 L (50 gal) to the capacity of the device. If the most sensitive element of the indicating system utilizes an indicator and graduations, the relative movement of these parts corresponding to a delivery of 5 L (1 gal) shall be not less than 5 mm (0.20 in).</p>			
<p><b>S.2. Design of Measuring Elements.</b></p> <p><b>S.2.1. Vapor Elimination.</b> - A device shall be equipped with an effective vapor eliminator or other effective means to prevent the passage of vapor through the meter.</p>			
<p><b>S.2.2. Provision for Sealing.</b> - 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 may be made of:</p> <p>(a) any measuring or indicating element;</p> <p>(b) any adjustable element for controlling delivery rate, when such rate tends to affect the accuracy of deliveries; and</p> <p>(c) any metrological parameter that will affect the metrological integrity of the device or system.</p> <p>When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.</p> <p><i>[Audit trails shall use the format set forth in Table S.2.2.]* (See Page 10)</i></p>			
<p><b>S.2.3. Directional Flow Valves.</b> - A measuring system shall be equipped with a valve or other effective means, automatic in operation and installed in or adjacent to the measuring element, to prevent reversal of flow of the product being measured.</p>			
<p><b>S.2.4. Maintenance of Liquid State.</b> - A device shall be so designed and installed that the product being measured will remain in a liquid state during the passage through the meter.</p>			
<p><b>S.2.5. Thermometer Well.</b> - For test purposes, means shall be provided to determine the temperature of the liquid either:</p> <p>(a) in the liquid chamber of the meter, or</p> <p>(b) in the meter inlet or discharge line and immediately adjacent to the meter.</p>			
<p><b>S.2.6. Automatic Temperature Compensation. [NOT ADOPTED]</b></p> <p><b>S.2.6.1. Provision for Deactivating.</b> - On a device equipped with an automatic temperature compensating mechanism that will indicate or record only in terms of liters compensated to 15 °C or gallons to 60 °F, provision shall be made to facilitate the deactivation of the automatic temperature compensating mechanism so that the meter may indicate, and record if it is equipped to record, in terms of the uncompensated volume.</p>			

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<p><b>S.2.6.2. Provision for Sealing.</b> - Provision shall be made for applying security seals in such a manner that an automatic temperature compensating system cannot be disconnected and that no adjustment may be made to the system.</p>			
<p><b>S.3. Design of Discharge Lines and Discharge Line Valves.</b></p> <p><b>S.3.1. Diversion of Measured Liquid.</b> - No means shall be provided by which any measured liquid can be diverted from the measuring chamber of the meter or the discharge line therefrom. However, two or more delivery outlets may be permanently installed if means are provided to insure that:</p> <p>(a) liquid can flow from only one such outlet at one time, and                      (b) the direction of flow for which the mechanism may be set at any time is definitely and conspicuously indicated.</p> <p>In addition, a manually controlled outlet that may be opened for the purpose of emptying a portion of the system to allow for repair and maintenance operations shall be permitted. Effective means shall be provided to prevent the passage of liquid through any such outlet during normal operation of the device and to indicate clearly and unmistakably when the valve controls are so set as to permit passage of liquid through such outlet.</p>			
<p><b>S.3.2. Delivery Hose.</b> - The delivery hose of a retail device shall be of the wet-hose type with a shutoff valve at its outlet end.</p>			
<p><b>S.4. Marking Requirements.</b></p> <p><b>S.4.1. Limitation of Use.</b> - 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 only when used in conjunction with specific accessory equipment, these limitations shall be clearly and permanently stated on the device.</p>			
<p><b>S.4.2. Discharge Rates.</b> - A device shall be marked to show its designed maximum and minimum discharge rates. The marked minimum discharge rate shall not exceed:</p> <p>(a) 20 L (5 gal) per minute for stationary retail devices, or                      (b) 20 percent of the marked maximum discharge rate for other retail devices and for wholesale devices.</p>			
<p><b>S.4.3. Location of Marking Information; Retail Motor-Fuel Dispensers.</b> - <i>The marking information required in General Code, Paragraph G-S.1. Identification shall appear as follows:</i></p> <p>(a) <i>within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser;</i></p> <p>(b) <i>either internally and/or externally provided the information is permanent and easily read;</i>  <i>and</i></p> <p>(c) <i>on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).</i></p> <p><b>Note:</b> The use of a dispenser key or tool to access internal marking information is permitted for retail motor-fuel dispensers. <i>[Nonretroactive as of January 1, 2003]</i></p>			

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	Yes	No	NA
<p><b>S.4.4. Temperature Compensation.</b> - If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recorded representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).</p>			
<p><b>N. Notes.</b></p>			
<p><b>N.1. Test Liquid.</b> - A device shall be tested with the liquid to be commercially measured or with a liquid of the same general physical characteristics.</p>			
<p><b>N.2. Vaporization and Volume Change.</b> - Care shall be exercised to reduce to a minimum, vaporization and volume changes.</p>			
<p><b>N.3. Test Drafts.</b> - Test drafts should be equal to at least the amount delivered by the device in 1 minute at its normal discharge rate.</p>			
<p><b>N.4. Testing Procedures.</b></p>			
<p><b>N.4.1. Normal Tests.</b> - The "normal" test of a device shall be made at the maximum discharge flow rate developed under the conditions of the installation. Any additional tests conducted at flow rates down to and including one-half the sum of the maximum discharge flow rate and the rated minimum discharge flow rate shall be considered normal tests.</p>			
<p><b>N.4.1.1. Automatic Temperature Compensation.</b> [NOT ADOPTED]</p>			
<p><b>N.4.1.2. Repeatability Tests.</b> - Tests for repeat-ability 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</p>			
<p><b>N.4.2. Special Tests.</b> - "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.</p>			
<p><b>N.4.2.1. For Motor-Fuel Devices.</b> - A motor-fuel device shall be so tested at a minimum discharge rate of:</p> <p>(a) 20 L (5 gal) per minute, or (b) the minimum discharge rate marked on the device, whichever is less.</p>			
<p><b>N.4.2.2. For Other Retail Devices.</b> - A retail device other than a motor-fuel device shall be tested at a minimum discharge rate of:</p> <p>(a) the minimum discharge rate that can be developed under the conditions of installation, or (b) the minimum discharge rate marked on the device, whichever is greater.</p>			

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	Yes	No	NA
<p><b>N.4.2.3. For Wholesale Devices.</b> - A wholesale device shall be so tested at a minimum discharge rate of:</p> <p>(a) 40 L (10 gal) per minute for a device with a rated maximum discharge less than 180 L (50 gal) per minute;</p> <p>(b) 20 percent of the marked maximum discharge rate for a device with a rated maximum discharge of 180 L (50 gal) per minute or more; or</p> <p>(c) the minimum discharge rate marked on the device, whichever is least.</p>			
<p><b>N.4.3. Money-Value Computation Tests.</b></p> <p><b>N.4.3.1. Laboratory Design Evaluation Tests.</b> - In the conduct of laboratory design evaluation tests, compliance with paragraph S.1.5.2. shall be determined by using the cone gear as a reference for the total quantity delivered. The indicated delivered quantity shall agree with the cone gear representation with the index of the indicator within the width of the graduation. The maximum allowable variation of the indicated sales price shall be as shown in Table 1 (see page 9).</p>			
<p><b>N.4.3.2. Field Tests.</b> - In the conduct of field tests to determine compliance with paragraph S.1.5.2. the maximum allowable variation in the indicated sales price shall be as shown in Table 1 (see page 9).</p>			
<p><b>N.5. Temperature Correction.</b> - Corrections shall be made for any changes in volume resulting from the differences in liquid temperatures between time of passage through the meter and time of volumetric determination in the test measure.</p>			
<p><b>T. Tolerances.</b></p> <p><b>T.1. Application.</b></p> <p><b>T.1.1. To Underregistration and to Overregistration.</b> - 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.</p>			
<p><b>T.2. Tolerance Values.</b> - The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2. (see page 9)</p>			
<p><b>T.3. Repeatability.</b> - When multiple tests are conducted at approximately the same flow rate, the range of the test results for the flow rate shall not exceed 40 percent of the absolute value of the maintenance tolerance and the results of each test shall be within applicable tolerance. This tolerance does not apply to the test of the automatic temperature compensating system.</p>			
<p><b>T.4. Automatic Temperature Compensating Systems.</b> - The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature compensating system activated shall not exceed:</p> <p>(a) 1.0 percent for mechanical automatic temperature compensating systems; and</p> <p>(b) 0.5 percent for electronic automatic temperature compensating systems.</p> <p>The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.</p>			

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<b>Table 1</b> 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¢
0.75/liter or \$3.00/gallon	2.50/liter or \$10.00/gallon	5¢	± 2-1/2¢	± 5¢

<b>Table T.2. Accuracy Classes and Tolerance for LPG and Anhydrous Ammonia Liquid-Measuring Devices</b>				
Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance
1.0	Anhydrous ammonia, LPG (including vehicle-mounted tank meters)	0.6%	1.0%	1.0%

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<b>Table S.2.2. Categories of Device and Methods of Sealing</b>	
<b>Category of Device</b>	<b>Method of Sealing</b>
<p><i>Category 1: No remote configuration capability.</i></p>	<p><i>Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.</i></p>
<p><i>Category 2: Remote configuration capability, but access is controlled by physical hardware.</i></p> <p><i>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.</i></p>	<p><i>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.</i></p>
<p><i>Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).</i></p> <p><i>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.</i></p>	<p><i>An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten 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.)</i></p>

[Nonretroactive as of January 1, 1995]