CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Extracts from the

CALIFORNIA CODE OF REGULATIONS

TITLE 4, DIVISION 9

WEIGHTS AND MEASURES FIELD REFERENCE MANUAL (2020)

Chapter 1
Tolerances and Specifications for Commercial Weighing and Measuring Devices

Part 6:

Article 2.	Weighing and Measuring Devices Not Included in NIST Handbook 44
Article 2.1.	Liquefied Petroleum Gas Tanks
Article 2.2.	Electric Watthour Meters
Article 2.3.	Carbon Dioxide Liquid-Measuring Devices

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
DIVISION OF MEASUREMENT STANDARDS

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ARTICLE 2. Specifications and Tolerances and Other Technical Requirements for Commercial Weighing and Measuring Devices Not Included in NIST Handbook 44

§ 4010. Application.

This article and Articles 2.1, 2.2 and 2.3 apply to tolerances, specifications and other technical requirements for commercial weighing and measuring devices that are not incorporated as part of National Institute of Standards and Technology's Handbook 44.

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

ARTICLE 2.1. Liquefied Petroleum Gas Tanks when Mounted on Highway Vehicles and Used as Measures

§ 4012. A. Application.

A.1. This code applies to liquefied petroleum gas tanks when mounted on highway vehicles and used as commercial measures. The code does not apply to the following devices:

(a) Devices used solely for dispensing a product in connection with operations in which the amount dispensed does not affect customer charges.

(b) Meters mounted on liquefied petroleum gas tanks (for which see code for Liquefied Petroleum Gas Meters).

A.2. See also General Code requirements.

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4012.1. S. Specifications.

S.1. Design of Liquefied Petroleum Gas Tanks.

S.1.1. Tank Requirements. Liquefied petroleum gas tanks when used as measures shall be so constructed and marked to fully comply with all requirements of the California State Department of Industrial Relations whenever such Department has jurisdiction pertaining to liquefied petroleum gas tanks.

S.1.2. Completeness of Delivery. A tank shall be so constructed that, when it is standing on a level surface, complete delivery can be made.

S.2. Design and Location of Liquefied Petroleum Gas Tank Gaging Devices.

S.2.1. General.

A dip pipe shall be so designed that it will distinctly and unmistakably define a capacity point when liquid is in contact with the lowest portion of the dip pipe.

S.2.2. Number of Dip Pipes.

When any tank is used as a measure, it shall be provided with one or more dip pipes, one of which shall indicate between 86 percent and 87 percent of the actual total capacity of the tank.

S.2.3. Permanently Installed.

Except as provided in S.2.5. and S.2.6., dip pipes shall be permanently installed as an integral part of the tank.

S.2.3.1. Cylindrical Tanks. Dip pipes on a cylindrical tank shall be installed with the location of the internal opening of the dip pipe or dip pipes on a line with the longitudinal axis of the tank midway between the ends. For the purpose of this article, “midway” means that the internal opening of the dip pipe or dip pipes shall not be more than 6 inches from the actual midway distance between the ends of the tank.

S.2.3.2. Spherical Tanks. The dip pipe or dip pipes on a spherical tank shall be installed with the location of the internal opening or openings of the dip pipe or dip pipes in line with the vertical axis of the tank.

S.2.4. Openings.

The internal opening of a dip pipe shall be not less than one-quarter inch standard iron pipe size, for at least the first two inches above the liquid, and the internal opening of the dip pipe shall be parallel to the surface of the liquid and shall approach the liquid through the vapor space when the tank is plumb and level. The maximum opening of the bleeder valve shall be a number fifty-four drill size.

S.2.5. Dip Pipes on Valves.

Dip pipes which are fastened to a valve or valves and are so installed as to be removable from the container and which are less than one-quarter inch standard iron pipe size shall be permitted only on containers of five hundred pounds water capacity or less.

S.2.6. Removable Dip Pipes.

Removable dip pipes may be used on containers having a capacity in excess of five hundred pounds if the opening and at least the first two inches of the dip pipe above the liquid is not less than one-quarter inch standard iron pipe size. Provision shall be made so the dip pipe or dip pipes may be sealed in place by a weights and measures official in such a manner their position cannot be changed or the dip pipe or dip pipes be removed without destroying or mutilating the seal or seals.

S.3. Marking of Capacity.

Each liquefied petroleum gas tank used as a measure shall be plainly and conspicuously marked with its capacity. This marking shall appear on the rear or side of the tank, adjacent to the outage indicator valve, in letters, figures, or numerals not less than 3/4 inch in height and not less than 1/2 inch in width. On tanks having one calibrated capacity, the marking shall indicate the tank capacity to the nearest gallon and shall also indicate without qualification that the capacity is measured to the dip pipe. In the case of a liquefied petroleum gas tank having more than one calibrated capacity, the marking required by this section shall indicate the capacity applicable to the respective dip pipe.

A marking statement may be expressed in terms of percentage of fill (i.e., 86 1/2 %), if followed by the required marking which states the calibrated capacity in terms of gallons to the dip pipe.

Each and all letters, figures or numerals required by this section shall be of like color or tint and shall contrast with the background of such sign or designation. The required markings shall be the responsibility of the owner of the liquefied petroleum gas tank.

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4012.2. N. Notes.

N.1. Test Liquid.

Water or light fuel oil shall be used as the test liquid for a liquefied petroleum gas tank.

N.2. Evaporation and Volume Change.

Care shall be exercised to reduce to a minimum, evaporation losses and volume changes resulting from changes in temperature of the test liquid.

N.3. Gaging.

When a liquefied petroleum gas tank is gaged to determine the proper position for an indicator or to determine what a capacity marking should be, tolerances are not applicable. The indicator shall be set and the tank capacity shall be marked as accurately as practicable.

This requirement applies to new liquefied petroleum gas tanks or following repairs or modifications that might affect tank capacities.

N.4. Adjustment and Remarking.

When a liquefied petroleum gas tank is found upon test to have an error in excess of the applicable tolerance, the capacity of the liquefied petroleum gas tank shall be adjusted to agree with its marked capacity, or its marked capacity shall be changed to agree with its capacity as determined by the test.

N.5. Inspection.

Weights and measures officials shall not inspect or certify liquefied petroleum gas liquid measuring devices until:

(a) A certificate of inspection covering such equipment has been issued by the Division of Industrial Safety, Department of Industrial Relations of the State of California; or

(b) In the case of equipment requiring inspection by the United States Department of Transportation, a certificate has been issued by that agency applicable to such equipment; or until

(c) Bonafide evidence has been presented that such inspection has been requested of the proper agency by the owner or operator of the equipment, and written permission

from the proper agency has been received by him to operate the equipment until the requested inspection has been made. The provisions of this section shall not apply to marine terminals, natural gasoline plants, oil refineries or oil tank farms.

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4012.4. T. Tolerances.

T.1. Application.

The tolerances hereinafter prescribed shall be applied to errors in excess and in deficiency.

T.2. Tolerance Values.

Maintenance and acceptance tolerances shall be as shown in Table 1.

TABLE 1.
MAINTENANCE AND ACCEPTANCE TOLERANCES ON LIQUEFIED PETROLEUM GAS TANKS

Nominal Capacity	Maintenance and Acceptance Tolerances
Gallons	Gallons
200 or less	1/2
201 to 400, inclusive	3/4
401 to 600, inclusive	1
601 to 800, inclusive	1-1/4
801 to 1,000, inclusive	1-1/2
Over 1,000	Add 1 quart per 200 gallons

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4012.5. UR. User Requirements.

UR.1. Filling.

A liquefied petroleum gas tank shall stand upon a level surface during the filling.

UR.2. Delivering.

During a delivery, a liquefied petroleum gas tank shall be so positioned as to assure complete emptying of tank.

Note: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

Error! Reference source not found.**ARTICLE 2.2. Electric Watthour Meters**

§ 4027. A. Application.

A.1. This code applies to electronic and mechanical electric energy submeters used for "commercial purposes".

A.2. See also National Institute of Standards and Technology (NIST) Handbook 44, Section 1.10, General Code requirements adopted in Article 1, Chapter 1, Sections 4000, 4001, 4002.

A.3. This code does not apply to the use of any weight or measure or weighing or measuring instrument used by a public utility in connection with measuring gas, electricity, water, steam, or communication service subject to the jurisdiction of the Public Utilities Commission.

A.4. Code sections and subsections with an (EM) notation apply to electronic meters only. Code sections and subsections with a (MM) notation apply to mechanical meters only. Code sections and subsections without (EM) or (MM) notation apply to both meter types.

§ 4027.1. D. Definitions.

Accuracy Class. A performance specification for instrument transformers which expresses the maximum deviation from the true value of a measured quantity. (Instrument Transformer Accuracy Class) example: a 0.2 accuracy class transformer would be more accurate than a 0.3 accuracy class transformer.

The component of electric power that performs work, typically measured in kilowatts (kW) or megawatts (MW). Also known as "real power." The terms "active" or "real" power are used to modify the base term "power" to differentiate it from Reactive Power. The active power (P_{ac}) or real power measured by a meter, is the product of voltage (E) times current (I) times the cosine of the angle by which the current lags the voltage (cos Φ) or power factor (pf). Pac = (E) (I) (pf) = (E) (I) (cos Φ) where Φ is the phase angle of the lag.

Alternating Current (AC). An electric current that reverses direction in a circuit at regular intervals.

Ampere. The practical unit of electric current. It is the quantity of current caused to flow by a potential difference of one volt through a resistance of one ohm. One ampere is one coulomb of charge per second.

Apparent Power: The product of the current and the voltage in a circuit.

Audit Trail. An electronic count and/or information record of the changes to the values of the calibration or configuration parameters of a device.

Balanced Load. Balanced load is used to indicate equal currents in all phases and relatively equal voltages between phases and between each phase and neutral (if one exists), with approximately equal watts in each phase of the load.

Basic Lightning Impulse Insulation Level (BIL). A specific insulation level expressed in kilovolts of the crest value of a standard lightning impulse. (Example: BIL = 10 Kv)

Burden (B). The impedance of the circuit connected to the instrument transformer's secondary winding. (Example: B = 21 Ohms Max.)

Commercial Purposes.

a) A quantity determination or statement of weight, measure, or count of any commodity or thing, used wholly or partially, as a basis for sale, or,

b) a quantity determination or statement of weight, measure, or count of any commodity or thing upon which, wholly or partially, a charge for service is based.

Coulomb. The meter-kilogram-second unit of electric charge equal in magnitude to the charge of 6.24 x 1018 electrons; charge transported through a conductor by a current of one ampere flowing for one second.

Creep. A continuous apparent measurement of energy in a meter with operating voltage applied and no power consumed.

Current. The rate of the electron flow past any one point in the circuit. The unit of measurement is coulombs per second or amperes.

Electronic Meter (EM). An electric watthour meter that does not have a rotor.

Element. A combination of a voltage-sensing unit and a current-sensing unit, which provides an output proportional to the quantities measured.

Form Designation (FM). (MM) An alphanumeric designation denoting the circuit arrangement for which the meter is applicable and its specific terminal arrangement. The same designation is applicable to equivalent meters for all manufacturers. (Example: FM 2S)

Hertz (Hz). Frequency or cycles per second. One cycle of an alternating current or voltage is one complete set of positive and negative values of the current or voltage.

Instrument Transformer. A transformer that reproduces in its secondary circuit, in a definite and known proportion, the voltage, or current of its primary circuit, with the phase relation preserved. Sometimes these devices may be referred to as VTs (Voltage Transformers) or CTs (Current Transformers).

Instrument Transformer-Rated Meter. A metering system with terminals arranged for connection to the secondary windings of external instrument transformers.

Instrument Transformer Ratio. The stated ratio of the primary circuit current or voltage compared to the secondary circuit current or voltage. (Example: CTR = 200 : 0.1)

Kilowatt (kW). A unit of power equal to 1,000 watts.

Kilowatthour (kWh). 1,000 watthours.

Line Service. The service conductors connecting the master meter to the submeter.

Load Service. The service conductors connecting the submeter to the tenant’s electrical load.

Master Meter. An electric watthour meter owned, maintained, and used for commercial billing purposes by the serving utility. All the electric energy served to a submetered service system is

recorded by the master meter.

Mechanical Meter (MM). A watthour meter with a rotor.

Meter Class (CL). The manufacturer's designated maximum amperes a meter can measure continuously without damage or exceeding limits of accuracy. (Example: CL 200)

Meter. An electric watthour meter.

Metrological Components. Elements or features of a measurement instrument or system that perform the measurement process or that may affect the final quantity determination or resulting price determinations. This includes accessories that can affect the validity of transactions based upon the measurement process. The measurement process includes determination of quantities; the transmission, processing, storage, or other corrections or adjustments of measurement data or values; and the display or recording of measurement values or other derived values such as price or worth or charges.

Ohm. Practical unit of electric resistance, which allows one ampere to flow when the impressed potential is one volt.

Percent Registration. Percent registration is calculated as follows:

$$\text{Percent Registration} = \frac{\text{Wh measured by meter}}{\text{WH measured by STANDARD}} \text{ X100}$$

Figure 1 - Image of Formula to Determine Percentage Error.

(Percentage error equals the watthour measured by the meter divided by the watthour measured by the standard multiplied by 100.)

Percent Error. Percent Error = Percent Registration – 100

Power Factor. The ratio of the active power to the apparent power.

Primary Watthour Constant (PKh) (MM). The meter Kh multiplied by the product of the current and/or voltage transformer ratio(s):

PKh = Kh (Current Transformer Ratio X Voltage Transformer Ratio)

Register Ratio (Rr) (MM). The number of revolutions of the gear meshing with the worm or pinion on the rotor shaft per complete rotation of the fastest (most sensitive) wheel or dial pointer.

Remote Configuration Capability. The ability to adjust a measuring device or change its sealable parameters from or through some other device that is not itself necessary to its operation and is not a permanent part of the adjustable device.

Revolution Equivalent. The number of watthours represented by one increment (pulse period) of serial data.

Serving Utility. The utility distribution company that owns the master meter and sells electric energy to the owner of the submeter system.

Stator (MM). The unit which provides the driving torque in a watthour meter. It contains a voltage coil, one or more current coils, and the necessary steel to provide the required

magnetic paths.

Submeter. A meter furnished, owned, installed, and maintained, by the customer who is served through a utility owned master meter.

Tenant. The person or persons served electric energy from a submetered service system.

Test Amperes (TA). The manufacturer's specified full load test amperage. (Example: TA 30)

Test Block. Device that facilitates safe meter testing by disconnecting the meter from the circuit without interrupting the service to the tenant.

Thermal Overload Protector. A circuit breaker or fuse that automatically limits the maximum current in a circuit.

Volt. The practical unit of electromotive force. One volt will cause one ampere to flow when impressed across a resistance of one ohm.

Voltage Transformer. A device which provides a secondary voltage which is a precise fraction of the primary voltage.

Watt. The practical unit of electric power. In an alternating-current circuit (AC), the power in watts is volts times amperes multiplied by the circuit power factor.

Watthour (Wh). The practical unit of electric energy, which is expended in one hour when the average load during the hour is one watt.

Watthour Constant (Kh). The expression of the relationship between the energy applied to the meter and one rotor revolution, or output indication, expressed as watthours per revolution or, watthours per output indication.

Watthour Meter. An electricity metering system comprised of components functioning together that measures and registers the integral, with respect to time, of the active power of the circuit in which it is connected. This power integral is the energy delivered to the circuit during the interval over which the integration extends. The unit in which this integral is measured is usually the kilowatthour.

Watthour Test Constant (Kt) (EM). The expression of the relationship between the energy applied to the meter system and corresponding occurrence of one test output indication expressed as watthours per test output indication.

NOTE: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Sections 12107, 12500, Business and Professions Code.

§ 4027.2. S. Specifications.

S.1. Metrological Components.

A meter system shall be designed and constructed so that metrological components are adequately protected from environmental conditions likely to be detrimental to accuracy. Components shall be designed to prevent undetected access to adjustment mechanisms and terminal blocks by providing for application of a physical security seal or an audit trail.

S.2. Terminals.

The terminals of the meter shall be arranged so that the possibility of short circuits while removing or replacing the cover, making connections, or adjusting the meter, is minimized.

S.3. Provision for Sealing.

S.3.1. Sealing. Provisions shall be made for applying a security seal in a manner that requires the seal to be broken, or for other approved means of providing security (e.g. audit trail available at the time of inspection), before an adjustment can be made that affects the metrological integrity of the meter. The audit trail shall use the format set forth in Table S.3.1.

Table S.3.1. Categories of Device and Methods of Sealing	
Category of Device	**Method of Sealing**
Category 1: No remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.	The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). 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.	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.)

S.4. Meter Identification and Marking Requirements.

The following identification and marking requirements are in addition to the requirements of National Institute of Standards and Technology (NIST) Handbook 44, Section 1.10, General Code, G-S.1.

Each meter shall have the following information legibly marked on the nameplate or register, if applicable.

(a) Manufacturer's name or trademark, type designation, and non-repetitive serial number.

(b) AC voltage rating.
(c) Test amperes (TA).
(d) Meter class (CL).
(e) Watthour or rotor constant (Kh).
(f) (MM) Register ratio (Rr) and multiplier (if greater than one).
(g) Frequency rating (Hz).
(h) Number of meter stator(s) or element(s).
(i) Watthour meter or other descriptive term.
(j) (MM) Number of wires (W).
(k) (MM) Form designation (FM).
(l) (EM) Watthour test constant (Kt).

Instrument transformer-rated meters shall contain the following additional information:

(m) Instrument transformer ratio or transformer model number.
(n) (MM) Primary watthour constant (PKh).
(o) Temperature Limits, if narrower than and within -20°C to +50°C (-4°F to 122°F).
(Nonretroactive as of February 12, 2009)

S.5. Abbreviations and Symbols.

The following abbreviations or symbols may appear on a meter, instrument transformer, or indicator.

(a) FM = Form
(b) CL = Class
(c) V = Volts
(d) Hz = Hertz, Frequency or Cycles Per Second
(e) TA = Test Amperes
(f) K_h = Watthour Constant Per Rotor Revolution or Pulse
(g) PK_h = Primary Watthour Constant
(h) R_r = Register Ratio
(i) CTR = Current Transformer Ratio
(j) VTR or PTR = Voltage or Potential Transformer Ratio
(k) MULT BY = Multiply By
(l) W = Wire (example: 240V 3W)
(m) Y = WYE Power Supply
(n) ANSI = American National Standards Institute
(o) B = Burden
(p) BIL = Basic Lightning Impulse Insulation Factor
(q) K_t = (EM) Watthour Test Constant
(r) AC = Alternating Current (i.e. VAC)
(s) Wh = Watthour
(t) kWh = Kilowatthour
(u) Δ = Delta Power Supply

S.6. Instrument Transformer.

S.6.1. Identification. *Each instrument transformer that is non-integral with the meter*

shall have a permanent identification label identifying the following:

(a) Manufacturer's name, type designation, and non-repetitive serial number
(b) True ratio, primary versus secondary, ampere or voltage values
(c) Accuracy class
(d) Burden designation (B)
(e) Basic lightning impulse insulation level (BIL)
(f) Rated Frequency (HZ)

Note: If evident by the method of integration that instrument transformers are not intended to be detachable or replaceable, the required information may be located on the meter.

(Nonretroactive as of February 12, 2009)

S.6.2. Accuracy Class. *An instrument transformer that is not an integral part of the meter and is used for revenue metering shall be rated 0.3 accuracy class or more accurate for the burden of a particular meter type. If a meter system requires an instrument transformer more accurate than 0.3 accuracy class, the limitations shall be stated on the meter.*

(Nonretroactive as of February 12, 2009)

S.6.3. Polarity Marking. A permanent mark indicating proper installation orientation is required on the instrument transformer when the accuracy of the meter is affected.

S.7. (MM) Meter Register.

A meter register shall clearly indicate the number of kilowatthours measured by the meter. The register ratio shall be indicated on the front of the registers that are not an integral part of the meter nameplate. Means shall be provided for the tenant to read the meter register.

S.8. (EM) Meter Watthour Display.

S.8.1. *All submeters in a service system shall have an individual customer display on or at the meter and the minimum value shall not exceed one kilowatt hour.*

(Nonretroactive as of February 12, 2009)

S.8.2. All submeter systems shall be capable of displaying at least one watthour test constant (Kt) output indication but not more than 20 watthour test constant output indications.

Means for displaying watthour test constant output indications include but are not limited to: decimal point, contrasting display colors, shorting link, or a means for visual flashing pulse counts.

(Nonretroactive as of February 12, 2009)

S.8.3. *The minimum display value (unit of measure) shall be conspicuously identified on or near the customer display.*

(Nonretroactive as of February 12, 2009)

S.8.4. *A segmented digital display shall have an easily accessible provision for checking that all segments are operational.*

(Nonretroactive as of February 12, 2009)

S.8.5. *If the display is not on continuously, it shall be accumulated continuously so that real-time measurement is displayed during activation.*

(Nonretroactive as of February 12, 2009)

S.9. Multiple Meter Indicating Elements.

An indicating or combination indicating-recording element coupled to two or more meter systems shall be provided with means to prohibit display of information from any meter system not selected, and shall be provided with automatic means to indicate clearly and definitely which meter system is associated with the indication.

S.10. (EM) Meter-Control Program.

The meter-control program shall be an integral part of the meter's firmware read-only memory that cannot be changed in its operating environment. This section does not apply to electronic meters that do not utilize a meter-control program.

S.11. (EM) Data Storage and Retrieval.

(a) Watthour data accumulated and displayed on the indicator shall be permanent and accessible.

(b) Values displayed or stored in memory shall not be affected by electrical, mechanical or temperature variations, radio-frequency interference, power failure, or any other environmental influences to the extent that accuracy is impaired.

(c) Memory and/or display shall be recallable for the life of the meter. A replaceable battery shall not be used for this purpose.

S.12. Temperature Range for Metering Components.

Meters shall be accurate and correct over the temperature range of -20 °C to +50 °C (-4 °F to 122 °F). If the meter and/or components are not capable of meeting these requirements the installations shall be limited to temperature limits stated on the meter.

(Nonretroactive as of February 12, 2009)

NOTE: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4027.3. N. Notes.

N.1. Meter Creep Test.

A meter creep test shall be conducted by applying rated voltage to the meter under test and no load applied.

N.2. Meter Starting Load.

A meter starting load test shall be conducted by applying rated voltage and 0.5-ampere load.

N.3. (MM) Test Revolutions.

Full and light load tests shall require 8 or more revolutions of the test standard and at least one revolution of the meter under test.

N.4. (EM) Meter Test Constant Output Indications.

Full and light load tests shall consist of 8 or more watthour test constant (Kt) output indications of the test standard and at least one watthour test constant (Kt) output indication of the meter under test. Test standards that read out directly in watthours shall meet the watthour equivalent of 8 or more watthour test constant (Kt) output indications.

N.5. Meter and System Test Loads.

(a) (MM) Mechanical self-contained meters shall be balanced load tested, and may be single element tested, for meter accuracy at full and light loads.

(b) (MM) Instrument transformer rated systems shall be single element tested, and may be balanced load tested, for system accuracy at full and light loads. Meter testing shall be accomplished by applying the test load to the current transformer(s).

(c) (EM) Instrument transformer(s) rated systems shall be single element tested, for system accuracy at full and light loads. Meter testing shall be accomplished by applying the test load to the instrument transformer(s) with the voltage circuits energized.

(d) The reference voltage phases (A, B, or C) at the meter shall be the same phase as the load.

N.6. Test of a Meter System.

(a) Each meter submitted for test shall be a complete system. For example: a meter body and any necessary instrument transformer(s), indicator(s), system software, etc., required to make up a complete system.

(b) The test load applied for a full load test shall be the marked test amperes (TA) on the nameplate of the meter under test.

(c) The test load applied for a light load test shall be conducted at not less than 10% of the marked (TA) test amperes on the nameplate of the meter under test.

(d) The test load applied for a full load test of a meter for a 0.5 power factor setting shall be the marked (TA) test amperes of the nameplate of the meter under test.

(e) The test load applied for a light load test of a meter for a 0.5 power factor setting shall be conducted at not less than 20% of the (TA) test amperes of the meter.

(f) All tests shall be made at the rated voltage ± 10%.

NOTE: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4027.4. T. Tolerances.

T.1. Meters with Separate Components.

Where instrument transformers or other components are used, the provisions of this section shall apply to all metering components.

T.2. Meter Creep Test.

T.2.1. (EM) The meter indicator or display shall not change by more than one least significant digit with the voltage circuit(s) energized and current circuit(s) not energized for a duration of one hour using the watthour test constant (Kt) output indications.

T.2.2. (MM) A meter rotor shall rotate no more than one complete revolution in 10 minutes with the meter voltage circuit(s) energized and the current circuit(s) not energized.

T.3. Meter Starting Load Test.

T.3.1. (EM) The watthour test constant (Kt) output indication shall continue to advance when a load of 0.5 amperes is applied.

T.3.2. (MM) The meter rotor shall rotate continuously when a load of 0.5 amperes is applied.

T.4. Application to Underregistration and to Overregistration.

The following prescribed tolerances shall be applied to errors of underregistration and errors of overregistration.

T.4.1. Tolerance Values. Maintenance and acceptance tolerances for electric watthour meters shall be as follows for full and light load tests:

(a) Maintenance tolerance shall be 2 percent for full and light loads.

(b) Acceptance tolerance shall be 1 percent for full and light loads.

T.4.2. Power Factor Tests. Power factor tests shall be conducted at 0.5 power factor setting:

(a) Maintenance tolerance shall be 2 percent for full and light loads.

(b) Acceptance tolerance shall be 1 percent for full and light loads.

NOTE: 0.5 power factor light load tests shall be conducted at 20 percent of the Test Amperes (TA).

NOTE: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Section 12107, Business and Professions Code.

§ 4027.5. UR. User Requirements.

UR.1. Selection Requirements.

UR.1.1. Meter Class. The meter class shall equal or exceed the total capacity in amperes of the thermal overload protectors of the tenant.

UR.1.2. Suitability of Equipment. A meter shall be suitable for use on its electrical system. A 3-wire two-phase load which is connected to a 120-208 volt network service shall be metered by a two-stator or two-element meter.

A meter shall accurately measure all loads 5 percent or greater of the electric service capacity of the tenant. Service capacity shall be determined by the master thermal overload protectors to the tenants' service or by the rated capacity of an electric cord and its connector used to provide power from the service panel to the tenant.

UR.1.3. Instrument Transformer Ratio. The instrument transformer shall be correctly matched to the meter indicator and multiplier

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UR.2. Installation Requirements.

UR.2.1. Regulation Conflicts and Permit Compliance. *If any provision of this section (UR.2. Installation Requirements) is less stringent than that required of a similar installation by the serving utility, the installation shall be in accordance with those requirements of the serving utility.*

The installer of any new electric watthour submeter service shall obtain all necessary permits and shall conform to California Public Utilities Commission (CPUC) Decision D 05-05-026, including but not limited to conformance with Section 8 of Pacific Gas and Electric Company (PG&E) Greenbook requirements.

(Nonretroactive as of February 12, 2009).

UR.2.2 Certification by Serving Utility or Public Utilities Commission. *It is the responsibility of the owner of the submeter system to obtain written certification for each*

submetered service connection from the serving utility or from a person designated as qualified by either the serving utility or by the California Public Utilities Commission (CPUC),.

The required certification shall identify the address, space, or number, of the premise served by the submeter connection, be signed by an authorized serving utility representative or by a designee, and shall clearly state:

a) the installation meets all serving utility installation and accessibility requirements for similar installations served directly by the serving utility,

b) the installation is on a tariff schedule that qualifies for submeter use,

c) the billing format, rates, and charges conform to Public Utilities Code Sections 739.5 or 12821.5 and to all applicable serving utility tariff rules,

d) the installation complies with CPUC Decision 05-05-026 and applicable Pacific Gas & Electric Company "Greenbook" requirements,

e) the date of such determination, and

f) if performed by a designee, the designee's name and title, and the name and title of the serving utility company or Public Utilities Commission representative authorizing the designee to make the determination.

The certification shall be provided to the county sealer prior to a submeter being used for commercial purposes.

(Nonretroactive as of February 12, 2009).

UR.2.3. Meter Test Facilities. All meters shall be provided with the same test facilities required of a similar meter by the serving utility.

UR.2.4. (MM) Test Blocks. All three-phase self-contained meter installations shall be equipped with test blocks, which are approved by the serving utility, for safe meter testing.

UR.2.5. (MM) Test Switches. Meter installations that are equipped with current or potential transformers, or both, shall have test switches installed, which are approved by the serving utility, for safe meter testing.

UR.2.6. (MM) Circuit Closing Devices. All self-contained meter installations that cannot accept a short interruption of the electrical service, for the purpose of testing the meter, shall be equipped with a manual circuit closing device as approved by the serving utility. Automatic circuit closing devices shall not be used on any meter installation.

UR.2.7. Metered Circuits (Load Service). All electricity used by a tenant shall be taken exclusively from the load service of the tenant's meter. This service and its associated meter shall accurately measure the tenant's load and be capable of being used only at the discretion of the tenant.

UR.2.8. Unmetered Circuits (Line Service). The tenant's electric circuit shall not be taken from the line terminals of the meter, meter socket, or line service. The owner of the submeter system may utilize this service.

UR.2.9. Dedicated Tenant Service. A meter shall serve only the space, lot, building, room, suite, stall, slip, or premise occupied by the tenant.

UR.2.10. Tenant Premise Identification. Tenant premise identification shall be clearly and permanently shown on or at the meter, and on all separate components of a meter system, including, but not limited to, instrument transformer(s), modem(s), and transmitter(s) if equipped. Remote indications and all printed indications shall be readily identifiable and readily associated with the tenant's premise. Printed indications shall also include time and date information.

U.R.3. Use Requirement.

UR.3.1. Submeter Required. When a tenant is not directly served by the serving utility, and charges for electric energy are not included in the fixed periodic rent charges, a dedicated electric watt-hour submeter that measures only the energy used at the discretion of the tenant shall be used.

NOTE: Authority cited: Sections 12027 and 12107, Business and Professions Code. Reference: Sections 12107, 12500, Business and Professions Code.

ARTICLE 2.3. Carbon Dioxide Liquid-Measuring Devices (See Chapter 1. Part 3. Section 3.38. – HB-44)