

DEPARTMENT OF FOOD AND AGRICULTURE  
PROPOSED AMENDMENT OF THE REGULATIONS

Title 4, Division 9, Chapter 1, Article 1, Section 4001 – Exceptions and Section 4002 – Additions, subsection 4002.9 Hydrogen Gas-Measuring Devices (3.39.)

**INITIAL STATEMENT OF REASONS**

**Background**

**1. General**

The overall mission of weights and measures is to preserve and maintain the standards of measurement essential in providing a basis of value comparison for the consumer and fair competition for industry. The principal task of weights and measures is to minimize measurement error in commercial transactions through the establishment and enforcement of standards that can be uniformly applied in the exchange of goods and services. Adherences to these standards provide both buyer and seller an assurance of equity, which is the foundation of an efficient and free market economy.

The Legislature has charged the Department of Food and Agriculture (Department) with the responsibility of supervising weights and measures activities within California (California Business and Professions Code (BPC), Division 5, Section 12100). The Secretary of the Department is granted the authority to adopt such regulations as a reasonably necessary to carry out the provisions of Division 5 of the BPC (BPC Section 12027).

The Department has the authority to regulate weighing and measuring devices used in commerce (BPC Section 12107). This is no small task since many commercial transactions are based upon the weight or volume of products bought and sold. Today, there are more than 1.4 million registered commercial weighing and measuring devices in California.

More specifically, BPC section 12107 gives the Department authorization to establish tolerances and specifications for all commercial weighing and measuring devices, which includes motor vehicle fuel dispensing systems. BPC Section 12107 states that the Secretary shall adopt, by reference, the latest standards as recommended by the National Conference on Weights and Measures (NCWM) and published in the National Institute of Standards and Technology (NIST) Handbook 44 "Specifications and Tolerances, and other Technical Requirements for Weighing and Measuring Devices," except as specifically modified, amended, or rejected by regulation adopted by the Secretary.

The requirements the Department adopts from NIST Handbook 44 are intended to prevent inaccurate quantities being delivered by commercial weighing and measuring devices. Accuracy tolerances are established so that neither buyer nor the seller suffers economic harm. The NIST Handbook 44 requirements (and any California-specific amendments made by the Department) are applied to commercial weighing and measuring devices: (a) while undergoing type evaluation by the Department, 2) during installation or repair by a RSA, and 3) during field testing by a weights and measures official.

(a) Type Evaluation by the Department. Before any weighing or measuring device can be sold or used in California for commercial applications, it must be evaluated and approved by the Department (BPC Section 12500.5). This process is known as “type evaluation”. Type evaluation is the examination of weighing or measuring devices for the legal purpose of certifying that its design and performance complies with all applicable weights and measures requirements for accuracy, reliability, etc. Once a commercial device type has been successfully evaluated by the Department, that make and model may be mass-produced for commercial purposes.

(b) Installation and Repair by a RSA. Maintenance and repair services of commercial weighing and measuring device are performed by companies registered with the Department. The specifications and tolerances of NIST Handbook 44 are applied when installing new devices or making corrective repairs. After verifying that the device meets all the design specifications and performance requirements, the RSA and their agents may place the device into service, pending official testing and sealing by a weights and measures official (BPC Sections 12509 (b), 12511.1, 12531, 12532). Utilizing RSAs saves device users money by allowing them to use the device immediately after installation or repair, rather than wait for an official’s visit.

(c) Field Testing by the County Sealers. The Department works closely with county sealers of weights and measures who, under the supervision and direction of the Secretary, carry out the majority of routine field testing of commercial devices. The purpose of routine field testing is to minimize the measurement error in commercial transactions. The specifications and tolerances of NIST Handbook 44 are applied in evaluating these commercial devices (BPC Sections 12107, 12210). Field officials also determine if a commercial device does not fulfill the purpose for which it was approved or if it is not identical to the approved type and notify the Department. When this occurs, the Department may prohibit the sale or installation of any previously approved type or design and determine if the device approval should be revoked or modified (BPC Section 12500.6).

## 2. Legislation

On July 21, 2005, Governor Schwarzenegger signed into law Senate Bill 76 (Chapter 91, Stats 2005). The goal of this law is to support the development of a network of hydrogen refueling locations in California, thereby reducing California's dependency upon oil and supporting the use of alternative fuels.

Assembly Bill 118 (Chapter 750, Statutes of 2007) created the Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program of the California Energy Commission to, among other objectives, develop and deploy technology and alternative and renewable fuels in the marketplace. Through the ARFVT Program, the CEC provided incentives to develop and deploy clean, efficient, low-carbon alternative fuels and technologies projects that among other goals, expand alternative fueling infrastructure and fueling stations.

AB 8 (Chapter 401, Statutes of 2013) was enacted to continue to move California toward the goal of expanding the market for clean energy and to reduce greenhouse gasses by providing funding to pay for the newer technologies. AB 8 amended Health and Safety Code 43018.9 with the goal to have at least 100 publicly available hydrogen-fueling stations in California and allocates \$20,000,000 per year to fund these stations.

## 3. Governor's Executive Orders

EXECUTIVE ORDER S-7-04 establishes the "California Hydrogen Highway Network" and instructs all relevant state agencies to work with key stakeholders, including nongovernmental organizations to implement the Executive Order and make hydrogen a readily available fuel throughout California.

EXECUTIVE ORDER B-16-2012 facilitates the rapid commercialization of zero-emission vehicles (ZEVs) in California. By definition, hydrogen fuel cell and electric vehicles are both considered ZEVs. The Executive Order sets 2015 as the target date for all major cities in California to have adequate infrastructure and be "zero-emission vehicle ready."

### **Description of the Public Problem, Administrative Requirements, or Other Conditions or Circumstances the Regulations are Intended to Address**

Accelerating the market for ZEVs is a cornerstone of California's long-term transportation strategy to reduce pollution and greenhouse gas emissions, save consumers money, and enable continued economic growth. In addition to promoting these vehicle technologies, the state supports the development and use of low carbon fuels, as well as planning more environmentally sustainable communities that reduce unnecessary vehicle travel and congestion.

The commercialization of hydrogen fueling stations is one of the biggest critical barriers preventing the widespread market penetration of hydrogen-fueled vehicles. A statement in the 2012 U.S. Department of Energy's Request for Information regarding hydrogen gas-measuring devices summarizes well the current dilemma: "In order to enable the commercialization of hydrogen, fueling equipment that meets measurement standards must be available to sell hydrogen fuel to the public by weight or volume. Based on available information, no commercially available devices are capable of meeting the National Institute of Standards and Technology's (NIST's) NIST Handbook 44 measurement accuracy requirements for hydrogen while being used under fueling conditions...."

The NIST Handbook 44 - 3.39. Hydrogen Gas-Measuring Devices – Tentative Code was adopted in 2010 by the NCWM. Since then, the Department has received two applications for type evaluation but neither has been successful. The first applicant withdrew their application after testing revealed the device was unable to comply with the accuracy requirements in NIST Handbook 44. For unknown reasons, the second applicant withdrew before testing could begin - it is believed to be related to the accuracy requirements. The Department believes the lack of type evaluation applications supports the need to temporarily relax the current accuracy tolerances so that hydrogen gas-measuring devices can be deployed commercially. With these proposed regulations, the Department seeks to balance consumer protection with the equipment currently available for use.

Today, sellers of hydrogen fuel have negated weights and measures requirements by agreeing on a predetermined price with the customer. The agreed-upon price must not include measurements of any kind, e.g., miles driven, tank pressure, or fuel gauge reading, which might be used to estimate the amount of fuel used. This has worked reasonably well in the absence of commercially available hydrogen gas-measuring devices, but even so, this practice is unfair to both buyer and seller as neither really knows the quantity dispensed.

The goals established in AB 8 (Chapter 401, Statutes of 2013) cannot be achieved if commercial hydrogen fueling stations do not have approved hydrogen gas-measuring devices. It is unlawful for a hydrogen fueling station to use a non-approved dispenser in a commercial application. The proposed regulations will allow hydrogen dispensers to meet interim specifications and tolerances and receive weights and measures certification today.

Executive Order B-16-12 established several milestones on a path toward 1.5 million ZEVs in California by the year 2025. The Governor's ZEV 2013 Action Plan identifies specific strategies and actions that state agencies will take to meet milestones of the executive order. In "Goal #1: Complete Needed Infrastructure and Planning", the Department is tasked to ensure that hydrogen can legally be sold as a retail transportation fuel. Specifically, the Department is required to "enact necessary legislation, regulations, standards or certifications to enable hydrogen to be sold commercially on a per kilogram basis" and "investigate

possible interim solutions relaxing accuracy requirements for hydrogen dispensers.”

The Department cannot comply with Executive Orders S-7-04 and B-16-2012 unless it is able to relax the accuracy tolerances found in NIST Handbook 44 - 3.39. Hydrogen Gas-Measuring – Tentative Code.

### **Benefits of the Regulation**

Currently, the transportation sector is the biggest contributor (40%) to California’s greenhouse gas emissions from high-carbon motor vehicle fuels. Vehicle emissions are a primary source of particulates, air toxins and smog in California. Hydrogen vehicles emit water vapor instead of carbon gasses and will help improve air quality, thus reducing the medical risks to Californians associated with pollution caused by high-carbon emitting vehicles.

The proposed regulations will assist with the acceleration of a market for ZEVs, a cornerstone of California’s long-term transportation strategy. The regulations will help open fueling stations and assist automobile manufacturers who are poised to sell hydrogen fuel cell vehicles. By paying for fuel that is sold through a measuring device, consumers pay only for the fuel they receive. Although these devices are currently less accurate than gasoline dispensers, this method of sale is superior than paying a flat fee. Manufacturers developing and selling hydrogen gas-measuring devices will be able to market their products because the regulations will establish achievable specifications and tolerances.

### **Economic Impact Analysis**

According to the California Fuel Cell Partnership document titled “A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles”, 68 hydrogen fueling stations are expected to be operational by the end of Calendar Year 2015. By 2018, it is expected that there will be more than 100 stations and over 53,000 fuel cell vehicles. Currently, only nine public stations are operational in California.

### **Economic Impact**

#### **1. Business**

The proposed regulations will affect three primary types of businesses: (a) device manufacturers, (b) fueling station owners, and (c) registered service agencies (RSA). Most of the costs these businesses will pay are based on the statutes that govern all commercial devices, not the direct result of these regulations.

(a) Manufacturers of hydrogen gas-measuring devices. The Department is mandated to recover all costs associated with type evaluation services (BPC Section 12500.9). Manufacturers of new measuring device types will benefit from these regulations because they will establish an achievable standard. Once the

device has passed type evaluation, the make and model may be mass-produced for commercial purposes. The Department estimates the cost of type approval at \$25,000.00 per new type of dispenser, which is comparable to type evaluation of other devices.

The Department is aware of approximately eight potential applicants for type evaluation which includes four gasoline dispenser manufacturers, three hydrogen gas producers and one individual who currently services hydrogen gas dispensers. The total impact on these businesses would be \$200,000.00 if all potential applicants submit devices and successfully complete type certification.

(b) Hydrogen fueling stations. Almost all of the 58 counties in California have ordinances that establish device registration fees that allow them to recover their testing and inspection costs (BPC section 12240). Commercial weighing and measuring device owners pay an annual registration fee consisting of: 1) a device fee, 2) a business location fee, and 3) a Department of Food and Agriculture administrative fee. The administrative fee provides funding for the training of county staff and oversight of their device inspection work. Owners of hydrogen gas-measuring devices would be obligated to pay an annual fee of approximately \$121.10 for the first device (\$20.00 device fee, \$100.00 business location fee, and \$1.10 administrative fee) and \$21.10 per additional device at the same location. If there are 100 hydrogen fueling stations with two hydrogen gas-measuring devices at each location, the total annual cost for all stations would be \$14,220.00 (100 X \$142.20).

(c) Registered service agencies (RSA). BPC section 12535 requires the following fees be paid annually to the Department by registered service agencies: \$200 registration fee plus \$100 for each additional location and \$25 per agent. In addition, each agent must pass an examination for a five year license. The agent license examination fee is \$35 (California Code of Regulations, Title 4, Division 9, Chapter 4, Section 4083). The Department retains 40% of the fees it collects from service agencies and agents, and gives 60% to the counties for their reinspection and oversight activities. There are approximately 700 registered service agencies and 2,200 licensed agents in California today. No company is currently registered to perform work on hydrogen gas-measuring devices.

The Department is unsure how many businesses will choose to repair hydrogen gas-measuring devices. Most of the 100 stations will be clustered in Southern California and a few in the northern metropolitan areas of the state. The Department believes that some of the approximately 50 service agencies who currently service compressed gas equipment will expand into this area. If service agencies include hydrogen gas-measuring devices in the scope of devices serviced, the total costs for these agencies will not change since they are already registered. The Department believes this is the most likely scenario because these established businesses already have the expertise and equipment.

If the RSA wishes to repair hydrogen gas-measuring devices but does not already possess the necessary equipment, the cost of equipment they need will depend on the test method used. Currently, there are three testing options being researched: gravimetric, pressure/volume/temperature (PVT), and master meter.

1) The gravimetric test equipment consists of two 70 megapascal (MPa) hydrogen on board storage tanks, an appropriate weigh scale, appropriate mass standards, miscellaneous venting hardware, and fittings for 70 MPa hydrogen service with an estimated cost of \$26,150.00. If the agent already has appropriate mass standards, the estimated cost drops to \$24,405.00.

2) The PVT test equipment consists of two 70 MPa hydrogen on board storage tanks, one pressure sensor, three temperature sensors, data acquisition software, a computer, miscellaneous venting hardware, and fittings for 70 MPa hydrogen service with an estimated cost of \$19,875.00.

3) The master meter test equipment consists of a master meter suitable for 70 MPa hydrogen service, miscellaneous hardware, and fittings for 70 MPa hydrogen service with an estimated cost of \$13,000. The master meter test method does not require an on board storage tank due to the ability to place the master meter in line between the dispenser and the vehicle.

There is nothing in the BPC that prohibits device owners from servicing their equipment. However, in order for device owners to place their equipment back into service after repair, they must register as a service agency. The Department believes this is not likely to happen given the high cost of equipment (described below).

## **2. Small Business**

According to the California Fuel Cell Partnership website, there are nine hydrogen fueling stations open to the public at this time. Only one is independently owned; all others are owned/operated by public agencies or major oil companies. The Department has not yet determined if this independent business qualifies as a small business according to Government Code Section 11342.610.

There are approximately 10,000 service stations throughout California that sell traditional fuels, e.g. gasoline and diesel. Many of these are independently owned and operated. The Department has anecdotally learned that one business model being used at several hydrogen fueling stations is that hydrogen fuel providers own the hydrogen gas-measuring device. They are leasing the space from the station owner to install the device, tanks, and associated equipment for fuel production and storage.

### 3. Consumers

It is recognized that error free, perfect performance of mechanical equipment is unattainable. Accuracy tolerances are established to fix the legal range of inaccuracy within which equipment will be officially approved for commercial use.

Because accuracy tolerance values can go in either plus or minus direction, they should be sufficiently small so that no serious injury to either the buyer or seller occurs. Consumers (*and* hydrogen fueling station owners) will be impacted by the proposed regulations, which would relax the accuracy tolerances from  $\pm 2\%$  to  $\pm 10\%$ .

If the retail price of hydrogen fuel is \$10.00 per kilogram (kg), the following table demonstrates the impact when a driver purchases 3 kg at a hydrogen fueling station.

Device Performance	Device delivers more	Device delivers less
Accuracy $\pm 2.0\%$	\$0.60	\$0.60
Accuracy $\pm 3.0\%$	\$0.90	\$0.90
Accuracy $\pm 5.0\%$	\$1.50	\$1.50
Accuracy $\pm 10.0\%$	\$3.00	\$3.00
	<b>Consumer Benefits</b>	<b>Station Owner Benefits</b>

Device accuracy is an important factor in every transaction. For example, at \$10.00/kg, a driver purchasing 3 kg of hydrogen from a dispenser that gives 2% less will overpay by \$0.60. If the dispenser dispenses 10% more, the station owner will lose \$3.00. The greater the quantity dispensed, the greater these financial impacts will be.

Metering fuel with wide accuracy tolerances is still significantly better than the current practice of selling hydrogen at a flat fee. If a fueling station charges \$30.00 per fill regardless of the amount dispensed, a fuel cell vehicle driver who receives 1 kg will pay \$30.00 (equivalent to \$30.00 per kg). The driver who receives 5 kg will also pay \$30.00 (equivalent to \$6.00 per kg). Clearly, the driver who frequently “tops off” their fuel tank due to the scarcity of operational fueling stations is being financially harmed by this method of sale.

#### **Results of the Economic Impact Assessment**

The Department has made an initial determination that the proposed regulation (1) will not eliminate jobs within California; (2) will not cause the elimination of businesses in California; and (3) will not cause the contraction of businesses currently doing business within California. The proposed regulations will (1) create opportunities in California for service agencies to expand into this technology; (2) create opportunities for businesses selling hydrogen gas-measuring devices in California; and/or (3) create the opportunity for existing fueling stations operating within California to expand their

business to include hydrogen fuel.

## **Estimated Cost or Savings to Public Agencies or Affected Private Individuals or Entities**

### **1. Public Agencies**

The Department has determined that the proposed regulations do not impose a mandate on local agencies or school districts. The Department has also determined that no cost or savings to any other state agency, no reimbursable costs or savings under Part 7 (commencing with Section 17500) of Division 4 of the Government Code to local agencies or school districts, no nondiscretionary costs or savings to local agencies or school districts, and no cost or savings in federal funding to the state will result from the proposed action.

The Department has made an initial determination that the action will not have a significant statewide adverse economic impact on housing costs or California businesses, including the ability of California businesses to compete with businesses in other states.

### **2. Affected Private Individuals or Entities**

According to data from the 2011-2012 California Health Interview Survey managed by the University of California, Los Angeles, 14.1% of all Californians suffer from asthma. Since the transportation sector is the source of much of the pollution, cleaner air will result in fewer visits to the emergency room. This would cause a savings to individuals and California and federal programs that cover these expenses for at-risk persons.

## **Federal Regulations**

The proposed regulations are not in conflict with any federal regulations contained in the Code of Federal Regulations. Moreover, the proposed regulations are not mandated by federal law or regulation.

The Department of Commerce, through NIST, has an Office of Weights and Measures (OWM), a non-regulatory agency, which serves to coordinate the activities of states. The NCWM is a professional organization of state and local weights and measures officials and representatives of business, industry, consumer groups, and federal agencies.

NIST/OWM partners with the NCWM to develop standards in the form of uniform laws, regulations, and methods of practice, which are then published by NIST. NIST Handbook 44 is one of these uniform regulations. When a state or local government adopts these standards, they become mandatory.

The Department has adopted NIST Handbook 44 as state regulation by reference (BPC section 12107) and may modify, amend, or reject any part as needed for California's purposes.

### **Alternatives Considered**

The Department must determine that no reasonable alternative it considered or that has otherwise been identified and brought to its attention would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or other provision of law.

In the Governor's ZEV 2013 Action Plan, the Department is directed to ensure that hydrogen can legally be sold as a retail transportation fuel. Specifically, the Department is instructed to "investigate possible interim solutions in advance of permanent regulatory changes, including ..... relaxing accuracy requirements for hydrogen dispensers."

If the Department chooses to do nothing, automobile manufacturers who have invested millions of dollars developing hydrogen fuel cell vehicles will not be able to market these vehicles in the state. This will restrict California's ability to protect the environment, stimulate economic growth, and improve the quality of life in the state.

If the Department chooses to do nothing, hydrogen gas-measuring devices will not be presented for type evaluation. If fueling stations use untested and unapproved devices to sell hydrogen based upon quantity, these stations will violate state law. Stations may continue to sell hydrogen on a contract basis, but there is potential for significant financial harm to either the buyer or seller.

Other than the directive in the Governor's ZEV 2013 Action Plan, no other alternatives have been submitted to the Department. The Department has determined that if it does not temporarily relax hydrogen gas dispenser tolerances, this inaction will prevent the establishment of a hydrogen fueling infrastructure in California, hampering the Governor's objective to introduce ZEVs and zero-emission fuels in the state.

The Department has considered and has determined that temporarily relaxing hydrogen gas-measuring device tolerances is the most effective means to facilitate the establishment of hydrogen fuel in the marketplace.

### **Specific Purpose of the Regulation: Necessity**

Existing law (BPC Section 12107) requires the Secretary of the Department of Food and to adopt, by reference, the latest standards NIST Handbook 44 except

as specifically modified, amended, or rejected by regulation adopted by the Secretary. It is necessary for the Department to amend the current specifications and tolerances in NIST Handbook 44 - 3.39. Hydrogen Gas-Measuring – Tentative Code in order to ensure that hydrogen can legally be sold as a retail transportation fuel and comply with Executive Orders S-7-04 and B-16-12.

### **Specific Purpose – By Section**

#### **Amend Chapter 1, Article 1, Section 4001- Exceptions**

The Department proposes to add the following sections from NIST Handbook 44 to the list found in Section 4001 Exceptions:

#### **Section 3.39. Hydrogen Gas-Measuring Devices - Tentative Code**

The Department proposes that this title be removed and replaced with Section 3.39. Hydrogen Gas-Measuring Devices without words “Tentative Code.” This change is necessary because a tentative code has only trial or experimental status and is not enforceable. Removal of these words will make clear that this is the basis of enforcement for hydrogen gas-measuring devices. Additionally, the Department proposes to remove the preamble as it is unnecessary and its presence will make it unclear that section 3.39 is to be used as an enforceable code.

#### **3.39. Hydrogen Gas-Measuring Devices. A.2. Exceptions (c)**

The Department proposes that this requirement be removed. NIST Handbook 44 is not specific as to what is meant by the “concentrations of specified impurities that exceed level limits.” California has adopted by regulation the most current version of SAE International fuel quality standard J2719.

#### **3.39. Hydrogen Gas-Measuring Devices. A.4. Type Evaluation**

The Department proposes that this section be removed. BPC Section 12500.5 already requires type evaluation and makes this section unnecessary and conflicting. The Department’s proposed relaxed accuracy tolerances will make it such that a hydrogen gas-measuring device will be unable to comply with the National Type Evaluation Program’s requirements to meet NIST Handbook 44 requirements.

#### **3.39. Hydrogen Gas-Measuring Devices. N.3. Test Drafts**

The Department proposes that this section be removed and replaced. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty.

**3.39. Hydrogen Gas-Measuring Devices. N.4.1. Master Meter (Transfer) Standard Test.**

The Department proposes that this section be removed and replaced. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty.

**3.39. Hydrogen Gas-Measuring Devices. N.4.2. Gravimetric Tests.**

The Department proposes that this section be removed and replaced. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty.

**3.39. Hydrogen Gas-Measuring Devices. N.4.3. PVT Pressure Volume Temperature Test.**

The Department proposes that this section be removed and replaced. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty.

**3.39. Hydrogen Gas-Measuring Devices. N.6.1.1. Repeatability Tests.**

The Department proposes that this section be removed and replaced. It is necessary to specify the size of the test draft used when verifying that a hydrogen gas-measuring device. If the proposed test draft size is too small, it will not be possible to get a measurement that is both reliable and repeatable. Also, if the test draft size is too small, it is difficult to verify compliance using the equipment presently available to officials and service agencies that repair hydrogen gas-measuring devices.

**3.39. Hydrogen Gas-Measuring Devices. T.2. Tolerances**

The Department proposes that the section above the table be removed and replaced. This section states that the tolerance values in table T.2. are only proposed values based on previous work from the U.S. National Work Group on Hydrogen. The Department cannot wait for recommendations from the U.S. National Work Group; it is necessary to move forward now to comply with the Governor's Executive Order to establish a hydrogen fueling infrastructure.

**3.39. Hydrogen Gas-Measuring Devices. Table T.2.**

The Department proposes that this table be removed and replaced. The current accuracy tolerances listed are not achievable (1.5% acceptance tolerance and 2.0% maintenance tolerance). No company has been able to successfully pass type evaluation with these accuracy tolerances. This has discouraged other companies from applying for type evaluation of their hydrogen gas-measuring

devices. In order to commercialize hydrogen fuel cell vehicles and allow the legal sale of hydrogen in California, it is necessary to set accuracy tolerances that can be achieved at this time. Sunset dates are included to make clear that these relaxed tolerances are temporary. As technology advances and more accurate dispensers can be built, hydrogen gas-measuring devices can move into a more accurate or “better” accuracy class. A sunset date also obligates the Department to conduct a review of the accuracy tolerances within the next five years.

### **3.39. Hydrogen Gas-Measuring Devices. T.3. Repeatability.**

The Department proposes that this section be removed and replaced. This section references N.6.1.1. which specifies that the test drafts be of approximately the same size, but had no requirement for the minimum weight of the test draft. If the proposed test draft size is too small, it will not be possible to get a measurement that is both reliable and repeatable. Also, if the test draft size is too small, it is difficult to verify compliance using the equipment presently available to officials and service agencies that repair hydrogen gas-measuring devices.

## **Add to Chapter 1, Article 1, Section 4002- Additional Requirements**

The Department proposes to add the following subsections to the list found in Section 4002:

### **4002.9 Hydrogen Gas-Measuring Devices (3.39.)**

The Department proposes to adopt a new subsection under 4002- Additional Requirements. The proposed subsection 4002.9 Hydrogen Gas-Measuring Devices (3.39.) includes specific requirements which are different from NIST Handbook 44, or are in addition to current language.

### **Section 3.39. Hydrogen Gas-Measuring Devices.**

The Department proposes that this title be removed and replaced with Section 3.39. Hydrogen Gas-Measuring Devices without words “Tentative Code.” This change is necessary because a tentative code has only trial or experimental status and is not enforceable. Removal of these words will make clear that this is the basis of enforcement for hydrogen gas-measuring devices. Additionally, the Department proposes to remove the preamble as it is unnecessary and its presence will make it unclear that section 3.39 is to be used as an enforceable code.

### **S.5.2. Location of Accuracy Class Information 3.0, 5.0, and 10.0 Information.**

The Department proposes to adopt a new section that is not part of NIST Handbook 44. The Department proposes that Section S.5.2. be added to require the accuracy class be posted visibly on the dispenser so the purchaser has information regarding the capabilities of the device at the time of sale. By posting accuracy class information, this will drive device manufacturers to advance the technology. At such time when more accurate devices enter the marketplace,

consumers will be able to make informed decisions and compare dispenser accuracy information between stations.

### **N.3. Test Drafts.**

The Department proposes that this section be added to replace NIST Handbook 44 Section N.3. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The test draft size also aligns with Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

#### **N.4.1. Master Meter (Transfer) Standard Test.**

The Department proposes that this section be added to replace NIST Handbook 44 Section N.4.1. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The test draft size also aligns with Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

#### **N.4.2. Gravimetric Tests.**

The Department proposes that this section be added to replace NIST Handbook 44 Section N.4.2. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The test draft size also aligns with Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

#### **N.4.3. PVT Pressure Volume Temperature Test.**

The Department proposes that this section be added to replace NIST Handbook 44 Section N.4.3. It is necessary to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The test draft size also aligns with Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

#### **N.6.1.1. Repeatability Tests.**

The Department proposes that this section be added to replace NIST Handbook 44 Section N.6.1.1. It is necessary to specify the size of the test draft used when verifying that a hydrogen gas-measuring device. If the proposed test draft size is too small, it will not be possible to get a measurement that is both reliable and repeatable. Also, if the test draft size is too small, it is difficult to verify compliance

using the equipment presently available to officials and service agencies that repair hydrogen gas-measuring devices.

### **T.2. Tolerances.**

The Department proposes that the section above the table be added to replace NIST Handbook 44 Section T.2. Tolerances. The Department cannot wait for recommendations from the U.S. National Work Group; it is necessary to move forward now to comply with the Governor's Executive Order to establish a hydrogen fueling infrastructure.

### **Table T.2. Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices**

The Department proposes that Table T.2. be added to replace NIST Handbook 44 Table T.2. The current accuracy tolerances listed are not achievable (1.5% acceptance tolerance and 2.0% maintenance tolerance). No company has been able to successfully pass type evaluation with these accuracy tolerances. This has discouraged other companies from applying for type evaluation of their hydrogen gas-measuring devices. In order to commercialize hydrogen fuel cell vehicles and allow the legal sale of hydrogen in California, it is necessary to set accuracy tolerances that can be achieved at this time. Sunset dates are included to make clear that these relaxed tolerances are temporary. As technology advances and more accurate devices can be built, hydrogen gas-measuring devices can move into a more accurate or "better" accuracy class. A sunset date also obligates the Department to conduct a review of the accuracy tolerances within the next five years.

### **T.3. Repeatability.**

The Department proposes that this section be added to replace NIST Handbook 44 Section T.3. Repeatability. This section references N.6.1.1. which specifies that the test drafts be of approximately the same size, but had no requirement for the minimum weight of the test draft. The test draft size must be sufficiently large to obtain a measurement that is both reliable and repeatable. If the test draft size is too small, it is difficult to verify compliance using the equipment presently available to officials and service agencies that repair hydrogen gas-measuring devices. The tolerance also aligns with Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

### **T.6. Tolerance – Minimum Measured Quantity (MMQ).**

The Department proposes that this section be added to adopt an additional tolerance that is not part of NIST Handbook 44. It is necessary to adopt a different tolerance for the minimum measured quantity because the test draft size in NIST Handbook 44 is so small that it creates increased measurement uncertainty. Increasing the tolerance also eliminates the need for more precise testing equipment. This tolerance also aligns with Organization of International Legal

Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

### **Technical, Theoretical, and/or Empirical Study, Reports or Documents**

The Department relied on the following documents in drafting the regulatory language of this proposal:

- “A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles”, California Fuel Cell Partnership, June 2012.
- National Institute of Standards and Technology *NIST Handbook 44, Specifications and Tolerances* and Other Technical Requirements for Weighing and Measuring Devices, “Introduction, P. System of Paragraph Designation”, “Hydrogen Gas-Measuring Devices – Tentative Code”, and Appendix A. Fundamental Considerations Associated with the Enforcement of Handbook 44 Codes, Section 2.2. Theory of Tolerances”, 2013.
- Governor’s Executive Order S-7-04.
- Governor’s Executive Order B-16-2012.
- National Institute of Standards and Technology Special Publication 1115 - Committee Reports for the 95th Annual Meeting of the National Conference on Weights and Measures (July 2010), Agenda Item 360-1 Tentative Code for Hydrogen Gas-Measuring Devices.
- Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.
- “2013 ZEV Action Plan - A roadmap toward 1.5 million zero-emission vehicles on California roadways by 2025” Governor’s Office; February 2013.
- U.S. Department of Energy Request for Information: High-Accuracy Hydrogen Meters (DE-FOA-0000753, MODIFICATION 001), August 29, 2012.
- Proposals considered to amend Handbook 44 Hydrogen Gas-Measuring Devices – Tentative Code - presented at the CEC/DMS Hydrogen Gas-Measuring-Devices Pre-rulemaking Workshop, August 27, 2013.
- California Fuel Cell Partnership Station Map Webpage, October 30, 2013.
- Eckerle, T., Garderet, R., “Hydrogen Network Investment Plan,” Energy Independence Now (October 2013).