

**MODULE 9:**  
**Acts, Codes, Regulations,  
and Guidelines**

**College of the Desert**  
Revision 0, December 2001

**XCELLSiS**  
*The Fuel Cell Engine Company*

**BALLARD**



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## **OBJECTIVES**

At the completion of this module, the technician will:

- understand the mandating of alternative fuel vehicles in the US
- understand the codes, regulation and guidelines concerning the use of hydrogen
- know where to look for additional information on hydrogen standards



## 9.1 Mandating of Alternative Fuel Vehicles In The U.S.

Alternative fuels for vehicles has been mandated through Federal and State laws in the US in response to the need to reduce air pollution, particularly in major cities. This section is a review of pertinent acts and regulations that were passed to instigate the development of alternative fuels for transportation uses. The following information is not all-inclusive since new acts, regulations and political initiatives continue to evolve.

### 9.1.1 Introduction

Air pollution is not a new problem in the nation or the world. In 1955, the Department of Health, Education and Welfare was authorized to begin a study of air pollution. Before this time, no one knew the extent to which automobiles contributed to the problem. By 1962, vehicle engines were determined to be responsible for over 40% of all airborne emissions—the single largest source of air pollution.

Legislation has been passed to mandate efforts to reduce these toxic and polluting emissions. A number of these regulations offer financial incentives to assist the transition to alternative fuel vehicles.

The major laws and policies are:

- Clean Air Act of 1963
- Alternative Motor Fuels Act of 1988
- Clean Air Act Amendments of 1990
- Energy Policy Act of 1992
- Federal Executive Order 12759-1991
- Federal Executive Order 12844-1993
- California Air Resource Board Regulations

### 9.1.2 The Clean Air Act, 1963

The U.S. Congress passed the original Clean Air Act (CAA) in 1963. This act required compliance with the National Ambient Air Quality Standards (NAAQS) by December 31, 1982. From then until the present, Congress has amended the act several times. Since the original Clean Air Act has failed to clean the air to the desired standard, Congress has made each new revision to the act more stringent.

#### 9.1.2.1 1970 Clean Air Act Amendments

The Clean Air Act Amendments (CAAA) of 1970 required that the concentration of pollutants in exhaust gases from transportation vehicles be reduced below the previously prescribed pollution limits. To ensure this

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reduction, specific emission standards for different types of vehicles were established under the Act for carbon monoxide, hydrocarbons, and oxides of nitrogen.

These amendments also required states that had areas in which pollutant concentrations exceeded the NAAQS (non-attainment areas) to develop State Implementation Plans (SIPs). These plans had to detail how the state planned to control emissions and reduce ambient air concentrations to the federally required levels.

#### 9.1.2.2 1988 Clean Air Act Amendments

The 1988 amendments to the Clean Air Act were significant because they gave the Environmental Protection Agency (EPA) the power to enforce regulations such as:

- Withholding federal funds from states with non-attainment areas. These funds include federal grants, highway trust funds, and new sources of construction money.
- Preparing and enforcing a Federal Implementation Plan (FIP) where states have failed to develop an adequate SIP for attaining NAAQS.
- Requiring non-attainment states to have revised SIPs filed with the EPA by May, 1991. In 1991, nearly 100 urban areas still failed to comply with NAAQS for at least one automotive pollutant.
- Providing manufacturers with CAFE (Corporate Average Fuel Economy) incentives to develop alternative fueled vehicles.

#### 9.1.2.3 1990 Clean Air Act Amendments

The 1990 Clean Air Act Amendments are among the most far-reaching environmental initiatives ever passed by the U.S. Congress, containing eleven separate titles under which the EPA issues regulations.

The 1990 CAAA Tier I standards began with vehicles produced in model year (MY) 1994. The proposed EPA phase-in for Tier I standards were:

Year	Vehicles
1994	40% of all new vehicles
1995	80% of all new vehicles
1996	100% of all new vehicles

Tier II standards are required for vehicles produced in MY 2004 and later. In order to reduce the amount of emissions from mobile sources, the only viable options are to reduce private travel or to use cleaner fuels and vehicles. Since it is nearly impossible to mandate a reduction in private travel, the Title II mobile source reduction program has three major components that deal with cleaner fuels and vehicles:

- Conventional gasoline and diesel powered vehicles sold throughout the U.S. after 1993 must meet tougher emission standards.

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- In the country's nine smoggiest cities, all conventional gasoline must be replaced by reformulated gasoline. A program to promote the use of clean vehicular fuels as an alternative to gasoline is required.
- The federal program also mandates that fleets in 22 urban non-attainment areas must purchase clean fuel vehicles along with a pilot alternative program for California.

The CAAA 1990 also extends the useful life requirements for passenger car emission control systems to comply with 5 years/50,000 miles to 10 years/100,000 miles. The law also establishes similar standards for all other types of vehicles.

From 1995 through 2005, the CAAA 1990 is estimated to result in 4.5 to 9.7 million vehicles operating on alternative fuels.

#### 9.1.2.4 1990 CAAA—Fleet Requirements

Fleets covered by this mandate include those with 10 or more vehicles that are capable of central refueling. The following fleet types are excluded:

- emergency vehicles
- rental vehicles
- demonstration vehicles
- off-road vehicles
- privately garaged vehicles

The CAAA 1990 covers vehicles with weight classifications from zero to 26,000 pounds GVW (gross vehicle weight) and applies to fleets located in the serious, severe, and extreme ozone non-attainment areas with 1980 populations of over 250,000. It also includes vehicles in one CO non-attainment area—Denver. The air quality standards compliance deadlines for the 96 non-attainment areas with populations over 250,000 range from three to 20 years, depending on the severity of their air quality. The most polluted non-attainment areas have the longest amount of time to achieve compliance.

In Phase I of the program, the percentages of passenger cars and light-duty trucks (up to 6000 GVW), which must be clean fuel vehicles (CFVs) are:

30% by MY 1998  
50% by MY 1999  
70% by MY 2000

For heavy-duty trucks (above 8,500 GVW and below 26,000 GVW), 50% must be CFVs by MY 1998.

The 1990 CAAA allows fleet owners to earn credits from early or extra purchases of CFVs or by acquiring vehicles that are certified to stricter emission standards than required, beginning in MY 1998. These stricter emission standards can be met by purchasing new vehicles that meet the

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clean fuel fleet vehicle standards of LEV (low emission vehicle), ULEV (ultra low emission vehicle) or ZEV (zero emission vehicle), or by converting conventional vehicles to cleaner fuels, or by redeeming credits.

### 9.1.3 Alternative Motor Fuels Act, 1988 (AMFA)

The Alternative Motor Fuels Act of 1988 (AMFA) encourages the development and use of alternative transportation through the development and widespread use of natural gas, methanol, and ethanol as transportation fuels and the production of alternative fuel powered vehicles. Three programs have been established to fulfill this goal.

The **Alternative Light Duty Vehicle Program** requires the federal government to purchase a “practical number” of alternative fueled passenger automobiles and light-duty vehicles. These vehicles must be powered by natural gas, alcohol or dual energy and must be purchased from original equipment manufacturers (OEM). The Department of Energy is also designated to conduct studies between standard passenger automobiles/light-duty trucks and alternative fueled vehicles that compare fuel economy, safety, emissions, operating and maintenance cost, and performance in cold weather and at high altitude.

The **Truck Commercial Application Program** conducts commercial application projects for alternative fueled vehicles in real-world operation environments in cooperation with heavy-duty engine manufacturers and other federal agencies.

The **Alternative Fuels Bus Testing Program** assists state and local government agencies in comparison testing of natural gas and diesel buses in urban areas. These tests include emissions levels, durability, safety and fuel economy.

Data collected from these projects are submitted to the Alternative Fuels Data Center (AFDC) which is operated and managed by the National Renewable Energy Laboratory in Golden, Colorado. The data is available to the public on-line and through the **National Alternative Fuels Hotline**.

### 9.1.4 Energy Policy Act, 1992 (EPACT)

The Energy Policy Act of 1992 (EPACT) was designed to establish a firm energy policy for the United States to reduce America’s dependence on foreign oil and to increase energy security through the use of domestically produced alternative fuels. EPACT includes a combination of mandates, incentives, funding for research and development, public information dissemination, and purchasing requirements for alternative fueled vehicles for the nation’s largest fleets.

EPACT defines alternative fuels to include methanol, ethanol, natural gas, propane, hydrogen, coal-derived liquids, biological materials, electricity or any other fuel that the Secretary of Energy finds to be substantially not petroleum and that would yield substantial energy security benefits and

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substantial environmental benefits. Under this definition traditional liquid fuels such as gasoline and diesel are not considered to be alternative fuels.

EPACT is designed to facilitate the development and implementation of alternative fuel technologies. Federal agencies and fuel providers (gas and electric utilities) are required to purchase AFVs beginning in fiscal year 1993. The law also encourages the purchase of more alternative fuel vehicles for federal fleets in order to accelerate the development of an OEM market. The goals for the following decade include:

- 5000 vehicles
- 7500 vehicles
- 10,000 vehicles
- 25% operating with clean fuels
- 33% operating with clean fuels
- 50% operating with clean fuels
- 75% operating with clean fuels

Executive Order No. 12448 (Nov. 1993) increased by 50% the number of alternative fuel vehicles mandated by the 1992 EPA for MY 1993-95.

EPACT also provides the following financial incentives:

- \$25 million per year for transit and school bus fleets to develop a clean-fuels urban bus program.
- \$30 million to provide low-interest loans.
- Income tax incentives including deductions from \$2000 to \$50,000 for buying clean-fuel vehicles.
- \$100,000 for clean-fuel refueling stations.

The U.S. Department of Defense and other research and development institutions also receive financial support.

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### 9.1.5 State Implementation Plan (SIP)

States with ozone non-attainment areas must include a Clean Fuel Vehicle Support Program that contains measures necessary to ensure the effectiveness of the Clean Fuel Vehicle Program established under Tier II of the 1990 CAAA. This program must be in their SIP.

### 9.1.6 California

#### 9.1.6.1 California Federal Pilot Program, 1996

The California Pilot Program started in MY 1996. This program mandated the production and sale of 150,000 clean fuel vehicles (CFV) per year for model years 1996 through 1998. For model years 1999 and beyond, the mandate increased to 300,000 vehicles per year. In addition, other states may voluntarily opt into the program. Vehicles must comply with low emission vehicle (LEV) standards.

The California federal pilot program is postponed if the CFVs are not available from original equipment manufacturers. The fleet operators are permitted, but not required, to purchase vehicles converted by a non-OEM.

#### 9.1.6.2 The California Air Resources Board (CARB)

California is the most proactive state in the U.S. for establishing stringent vehicle emission standards. The air quality in many regions in California is so poor that the California Air Resources Board decided not to wait until federal mandates take effect. The standards developed by CARB are more stringent than those called for by the CAAA. Many states have adopted or are adopting legislation similar to California's. If standards have not been established by federal agencies pertaining to LPG kits and conversions, the standards adopted by the CARB are recommended. Refer to 1994 Progress.

#### 9.1.6.3 California Non-Attainment Areas

The following California cities have been identified as non-attainment areas for ozone and/or carbon monoxide.

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City	Severity	Key Points & Notes
<b>Ozone Non-Attainment</b>		
Los Angeles (including LA County, Anaheim and Riverside)	Extreme	
Oakland	Moderate	
San Diego	Severe	
Santa Barbara	Moderate	
Bakersfield	Serious	
San Francisco	Moderate	
Fresno	Serious	
San Jose	Moderate	
Sacramento	Serious	
Visalia	Moderate	
<b>CO Non-Attainment</b>		
Los Angeles (including LA County, Anaheim and Riverside)	Serious	
Sacramento	Moderate	
Chico	Moderate	
San Diego	Moderate	
Fresno	Moderate	
San Francisco	Moderate	
Modesto	Moderate	
San Jose	Moderate	
Oakland	Moderate	
Stockton	Moderate	

**Table 9-1** California Non-Attainment Areas

#### 9.1.6.4 California LEV Phase-In Program

California legislation allows Air Quality Management Districts (AQMDs) to mandate the purchase of LEVs by fleets having 10 or more vehicles if the state's air quality standards are not met. The law also required retail fuel suppliers to provide 90 alternative fuel fueling locations by 1994 and 400 refueling locations by 1997. Passage of SB 135 in late 1991 required all passenger vehicles for hire in non-attainment areas to use alternative fuels. Twenty-five percent of vehicles purchased by the Department of General Services must be LEVs. AQMDs in non-attainment areas can mandate fleet purchases of LEVs.

A minimum number of LEVs, ULEVs, and ZEVs have been mandated for new car sales. The California LEV Phase-in program mandates the following percentage of vehicles for every model year.

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Model Year	STD. (0.39)	STD. (0.25)	TLEV	LEV	ULEV	ZEV
1994	10%	80%	10%			
1995		85%	15%			
1996		80%	20%			
1997		73%		25%		
1998		48%		48%		
1999		23%		73%	2%	2%
2000				96%	2%	2%
2001				90%	5%	5%
2002				85%	10%	5%
2003				75%	15%	10%

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**Table 9-2** Mandated California Vehicle Types

## 9.2 Codes and Standards

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Standards, rules, regulations and guidelines affecting alternative fuel vehicles are still changing. As a result, the following summary is not all-inclusive and may not reflect the most recent information. Transportation businesses for each country, state or county should have an understanding of the most recent codes and standards.

### *US Department of Transportation (DOT) Regulations*

The US Department of Transportation establishes rules and regulations governing interstate transportation of materials. These regulations are covered by Title 49 of the Code of Federal Regulations (CFR), entitled Transportation. The DOT regulations have been adopted from specifications and regulations, which evolved from existing industry standards.

### *National Fire Protection Agency (NFPA) Regulations*

The National Fire Protection Association (NFPA) is a non-profit, voluntary association devoted solely to fire prevention and safety. Since 1896, the NFPA has published guidelines for fire prevention, fire fighting procedures, and fire protection for many different industries. Motor vehicle fuel storage, fuel dispensing, and engine operation are covered by NFPA guidelines. These guidelines are generally accepted as minimum requirements.

The NFPA provides various services including fire prevention training programs for use in public education programs and technical publications on fire prevention and safety. One of the most important services provided by NFPA is the coordination of the development of fire safety codes for specific industries. The latest edition was published in 1995.

Your shop safety policy should reflect the appropriate local and state laws that apply. If there is no other standard to follow, refer to relevant National Fire Protection Association publication.

### 9.2.1 Industrial Use Of Hydrogen

Current codes, standards and guidelines for hydrogen were developed for industrial applications. The following list includes hydrogen-specific and related codes and standards used for a long time in industrial applications.

#### 9.2.1.1 U.S. Codes and Standards for Industrial Use of Hydrogen

##### **American Petroleum Institute**

API 941      Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants

**American Society for Mechanical Engineers**

- ASME           Boiler and Pressure Vessel Code
- ASME B31.3    American National Standard Code for Chemical Plant and  
                  Petroleum Refinery Piping

**Compressed Gas Association**

- CGA G-5        Hydrogen, Fourth Edition
- CGA G-5.3     Commodity Specification for Hydrogen, Fourth Edition
- CGA G-5.4     Standard for Hydrogen Piping Systems at Consumer  
                  Locations
- CGA G-5.5     Hydrogen Vent Systems
- CGA P-6        Standard Density Data, Atmospheric Gases & Hydrogen,  
                  Fifth Edition
- CGA S-1.1     Pressure Relief Device Standards, Part 1 - Cylinders for  
                  Compressed Gases
- CGA S-1.2     Pressure Relief Device Standards, Part 2 - Cargo and  
                  Portable Tanks for Compressed Gases
- CGA S-1.3     Pressure Relief Device Standards, Part 3 - Compressed  
                  Gas Storage Containers

**Dept. of Transportation — National Highway Transportation Safety  
Administration (NHTSA)**

- FMVSS 301     Fuel System Integrity
- FMVSS 303     Fuel System Integrity of CNGVs
- FMVSS 304     CNG Fuel Containers
- 49 CFR         Regulations for Transportation Equipment and the Trans-  
                  port of Hydrogen (Parts 100-199, 301-398)

**Department of Labor — Occupational Safety and Health Administra-  
tion (OSHA)**

- 29 CFR 1910.103    Hydrogen

**Federal Specification**

- BB-H-866        Gaseous Hydrogen Grades for Cutting and Welding and  
                  as a Lifting Medium for Balloons
- ZZ-H-461 D      Hose and Hose Assembly, Rubber, Gas (Acetylene-  
                  Hydrogen, Air and Oxygen)

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GUIDELINES**
**National Fire Protection Association**
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NFPA 10	Standard for Portable Fire Extinguishers
NFPA 30A	Automotive & Marine Service Station Code
NFPA 50A	Standard for Gaseous Hydrogen Systems at Consumer Sites
NFPA 50B	Standard for Liquefied Hydrogen Systems at Consumer Sites
NFPA 52	CNG Vehicular Fuel Systems
NFPA 54	National Fuel Gas Code. This code is a safety code that applies to the installation of fuel gas piping systems, fuel gas utilization equipment and related accessories.
NFPA 55	Compressed & Liquefied Gases in Portable Cylinders
NFPA 58	Storage & Handling of Liquefied Petroleum Gases
NFPA 70	National Electric Code. Practical safeguarding of persons and property from the hazards arising from the use of electricity.
NFPA 88A	Standards for Parking Structures. Covers the construction and protection of, as well as the control of hazards in, open, enclosed, basement and underground parking structures. It does not apply to one- and two-family dwellings.
NFPA 88B	Standards for Repair Garages. Covers the construction and protection of, as well as the control of hazards in garages used for major repairs and maintenance of motorized vehicles and any sales and servicing facility associated therewith.
NFPA 496	Purged & Pressurized Enclosures for Electrical Equipment
NFPA 497A	Classification of Class I Hazardous Locations. Applies to locations where flammable gases or vapors, flammable liquids or combustible liquids are processed or handled and where their release to the atmosphere may result in their ignition by electrical systems or equipment.
NFPA 497M	Classification of Gases, Vapors and Dusts for Electrical Equipment in Hazardous Locations
NFPA 513	Standard for Motor Freight Terminals
NFPA 853	Installation of Stationary Fuel Cell Power Plants
NFPA MY-HLH-88	Electrical Installations in Hazardous Locations

**Natural Gas Vehicle Coalition**

NGV1 CNGV Fueling Connection Devices

NGV2 Basic Requirements for CNGV Fuel Containers

9.2.1.2 Canadian Codes, Standards and Regulations for Industrial Use of Hydrogen

**Canadian Electrical Code**

Canadian Electrical Code Part 1, C22.1, Safety Standard for Electrical Installations

Electrical Systems in Hydrogen Installations

**Transport Canada**

Regulations for the Transportation of Hydrogen

Transportation of Dangerous Goods Act and Regulations

Transportation of Liquid Hydrogen

Transportation of Portable Hydrogen Containers and Cylinders

**Canadian Standards Association International (CSA)**

CSA B51 Code for Boilers, Pressure Vessels and Pressure Piping Code Containing Hydrogen

CSA B51-M Construction and Inspection of Boilers and Pressure Vessels

9.2.2 Non-Industrial Use Of Hydrogen

A variety of organizations have been working on codes, standards and guidelines for the design and operation of non-industrial hydrogen applications, including fueling stations and fuel cell vehicles.

Prominent are the role played by the International Standards Organization Technical Committee 197 (ISO), the National Hydrogen Association (NHA), and the Canadian Hydrogen Association (CHA). These organizations used the Natural Gas Vehicle Coalition codes as a model.

**American National Standards Institute (ANSI)**

ANSI Z21.83 Fuel Cell Power Plants

**American Society for Mechanical Engineers**

ASME PTC 50 Performance Testing for Fuel Cells

**Institute of Electrical and Electronics Engineers (IEEE)**

IEEE SCC.21 Standard for Instrumentation

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**International Standards Organization — Published**

ISO 13984      Liquid Hydrogen - Land vehicle fueling system interface

ISO 14687      Hydrogen Fuel - Product specification

**International Standards Organization — Under Development**

ISO/CD 13985      Liquid hydrogen - Land vehicle fuel tanks.  
Part 1: Design, fabrication, inspection and testing.  
Part 2: Installation and maintenance.

ISO/WD 13986      Tank containers for multi-modal transportation of liquid hydrogen

ISO/WD 15594      Airport hydrogen fuelling facility

ISO/WD 15866      Gaseous hydrogen blends and hydrogen fuel - Service stations

ISO/WD 15869      Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks.  
Part 1: General Requirements.  
Part 2: Particular requirements for metal tanks.  
Part 3: Particular requirements for hooped wrapped composite tanks with a metal liner.  
Part 4: Particular requirements for fully wrapped composite tanks with a metal liner.  
Part 5: Particular requirements for fully wrapped composite tanks with a non-metallic liner.

ISO/WD 15916      Basic requirements for the safety of hydrogen systems

ISO/AWI 17268      Gaseous hydrogen - Land vehicle filling connectors

**National Hydrogen Association — Working Groups**

WG1      Connectors

WG2a.      Tanks and Containers

WG2b.      Hydrides

WG3      Refueling Stations

WG4      (Disbanded)

WG5/6      Codes and standards for self-service refueling of vehicles with hydrogen and certification program for hydrogen vehicle fuel systems

WG7      Codes and standards for maritime unique applications of hydrogen

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### 9.3 Hydrogen Publications

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#### *The Sourcebook for Hydrogen Applications*

By the Canadian Hydrogen Association (CHA) and the National Hydrogen Association (NHA) for the Department of Natural Resources Canada and the U.S. Department of Energy. 1998.

This sourcebook is a single-volume reference on the safe use of hydrogen, including applicable codes, standards, regulations, guidelines and prevailing practices. It provides an outline of key safety considerations for non-industrial applications. A content outline is posted on the NHA website. The sourcebook comes as both paper and CD-ROM. It is available from the CHA, the NHA or the publisher:

TISEC Inc. 2113A St. Regis Boulevard  
Dollard, Montreal, Quebec, Canada H9B 2M9  
514-684-9096 or 800-531-2863  
sourcebook@tiseec.com

#### *Safety Standards for Hydrogen and Hydrogen Systems*

By the National Aeronautics and Space Administration, Office of Mission Assurance, Washington, DC, NSS 1740.16, February 1997

These standards establish a “uniform agency process for hydrogen system design, materials selection, operation, storage and transportation.” It includes the minimum guidelines for NASA. For a copy, contact:

Director, Safety and Risk Management Division, NASA  
Office of the Associate for Safety and Mission Assurance  
Washington, DC 20546 USA. Phone 202-358-2406

#### *Direct-Hydrogen-Fueled Proton-Exchange-Membrane Fuel Cell System for Transportation Applications: Hydrogen Vehicle Safety Report*

By Directed Technologies, Inc., and the Ford Motor Company for the U.S. Department of Energy DOE/CE/50389-502, May 1997

This report presents a detailed review of the safety characteristics of a hydrogen-fueled fuel cell vehicle. Emphasis is given to on-board high-pressure gaseous hydrogen storage methods. The analysis includes the normal operation of a vehicle, its fueling, indoor storage, collisions and tunnel operation. The report identifies risks and failure modes with potential hazardous conditions, as well as potential countermeasures for prevention and harm reduction. The risks are compared to vehicles powered by gasoline, propane and natural gas. For a copy, contact:

National Technical Information Service  
U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161 USA  
www.ntis.gov

## 9.4 Regulatory Organizations

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### 9.4.1 USA

#### **American Gas Association (AGA)**

1515 Wilson Blvd.  
Arlington, VA 22209 USA  
703-841-8574  
[www.aga.org](http://www.aga.org)

#### **American National Standards Institute (ANSI)**

11 W. 42nd St., 13th Floor  
New York, NY 10036 USA  
212-642-4900  
[www.ansi.org](http://www.ansi.org)

#### **American Society of Mechanical Engineers (ASME)**

Three Park Avenue  
New York, NY 1001 6-5990 USA  
800-THE-ASME  
[www.asme.org](http://www.asme.org)

#### **Compressed Gas Association (CGA)**

Suite 1004 - 1725 Jefferson David Hwy.  
Arlington, VA 22202-4102 USA  
703-412-0900  
[www.cganet.com](http://www.cganet.com)

#### **International Code Council, Inc. (ICC)**

5203 Leesburg Pike, Suite 708  
Falls Church, VA 22041 USA  
703-931-4533  
[www.inticode.org](http://www.inticode.org)

#### **National Fire Protection Association (NFPA)**

1 Batterymarch Park  
Quincy, MA 02269-9101 USA  
617-770-3000  
[www.nfpa.org](http://www.nfpa.org)

#### **National Hydrogen Association (NHA)**

1800 M Street N.W. Suite 300  
Washington, DC 20036-5802 USA  
202-223-5547  
[www.hydrogenus.com](http://www.hydrogenus.com)

#### **Society of Automotive Engineers (SAE)**

400 Commonwealth Dr.  
Warrendale, PA 15096-0001 USA  
724-776-3760  
[www.sae.org](http://www.sae.org)

**U.S. Department of Labor**

Occupational Safety & Health Administration (OSHA)  
Office of Public Affairs - Room N3647  
200 Constitution Avenue  
Washington, D.C. 20210 USA  
202-693-1999  
[www.dol.gov](http://www.dol.gov)

**U.S. Department of Transportation (DOT)**

400 7th Street, SW  
Washington, DC 20590 USA  
202-426-4000  
[www.dot.gov](http://www.dot.gov)

**U.S. Environmental Protection Agency (EPA)**

National Vehicle and Fuel Emissions Laboratory  
2565 Plymouth Rd.  
Ann Arbor, MI 48105 USA  
313-668-4275  
[www.epa.gov](http://www.epa.gov)

**California Air Resources Board (CARB)**

9528 Telstar Ave.  
El Monte, CA 91731-2900 USA  
818-575-6800  
[www.arb.ca.gov](http://www.arb.ca.gov)

**South Coast Air Quality Management District (AQMD)**

21865 E. Copley Dr.  
Diamond Bar, CA 91765-4182 USA  
909-396-2000  
[www.aqmd.gov](http://www.aqmd.gov)

**9.4.2 Canada****Canadian Gas Association (CGA)**

20 Eglinton Avenue West  
Suite 1305, P.O. Box 2017  
Toronto, Ontario, Canada M4R 1K8  
416-481-1828  
[www.cga.ca](http://www.cga.ca)

**Canadian General Standards Board (CGSB)**

CGSB Sales Centre  
Ottawa, Ontario, Canada K1A 1G6  
819-956-0425 or 800-665-CGSB (within Canada)  
[www.pwgsc.gc.ca/cgsb](http://www.pwgsc.gc.ca/cgsb)

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**Canadian Hydrogen Association (CHA)**

5 King's College Road  
Toronto, Ontario, Canada M5S 3G8  
416-978-2551  
www.h2.ca

**Canadian Standards Association International (CSA International)**

604-244-6652  
www.cssinfo.com

**Canadian Standards Organization (CSO)**

178 Rexdale Blvd.  
Etobicoke, Ontario, Canada M9W 1R3  
416-747-4000  
www.csa.ca

**Transport Canada**

330 Sparks Street  
Ottawa, Ontario, Canada K1A 0N5  
613-990-2309  
www.tc.gc.ca  
For Transportation of Dangerous Goods Act and Regulations

**9.4.3 Japan****High-pressure Gas Safety Institute of Japan**

Sumitomo Shin Toranomom Bldg.  
4-3-9, Toranomom, Minato-ku  
Tokyo, Japan 105-8447  
81-3-3436-6103  
www.khk.or.jp

**Japan Industrial Gases Association (JIGA)**

3-2-6, Kasumigaseki, Tiyoda-ku  
Tokyo, Japan 100-0013  
81-3-3580-0886  
www.jiga.gr.jp

**9.4.4 International****International Standards Organization (ISO)**

Ms. Sylvie Gingras,  
Secretary of ISO/TC 197  
Bureau de normalisation du Quebec  
333, rue Franquet  
Sainte-Foy, Quebec  
Canada G1P 4C7  
418-652-2238  
www.iso.ch/iso/en

or  
Dr. Tapan K. Bose  
Hydrogen Research Inst., UQTR  
P.O. Box 500  
Trois-Rivieres, Quebec  
Canada G9A 5H7  
819-376-5139  
Tapan-Bose@UQTR.UQuebec.ca

## Key Points &amp; Notes

**9.5 Research Organizations**

## Key Points &amp; Notes

Contact the following organizations for more information on hydrogen powered and fuel cell vehicles:

**Alternative Fuels Data Center**

National Renewable Energy Laboratory  
1617 Cole Blvd.  
Golden, CO 80401-3393 USA  
303-231-1288

**Daimler-Chrysler Corporation**

FFVs and NGVs  
800 Chrysler Dr. East  
Auburn Hills, MI 48326-2757 USA  
313-576-4991

**Ford Motor Company**

Alternative Fuels Division  
14310 Hamilton Ave.  
Highland Park, MI 48203 USA  
800-258-3835

**Gas Research Institute**

8600 Bryn Mawr Ave.  
Chicago, IL 60631 USA  
312-399-8170

**General Motors Corp.**

Alternative Fuels Division  
30500 Mound Rd., ARMB 336  
Warren, MI 48090 USA  
313-986-5719

**Idaho National Environmental Engineering Laboratory**

Institute of Gas Technology  
3424 S. State Street  
Chicago, IL 60616-3896 USA  
312-567-3877

**National Alternative Fuels Hotline**

P.O. Box 70879  
Washington, DC 20024 USA  
800-423-1363

**U.S. Department of Energy (DOE)**

Office of Domestic and Energy Policy  
Mail Stop EP (PE-50)  
1000 Independence Ave., SW  
Washington, DC 25085 USA  
202-586-4456  
[www.doe.gov](http://www.doe.gov)