



California State Fire Marshal Information Bulletin 14-010

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ADOPTION OF NFPA 2 HYDROGEN TECHNOLOGIES CODE FOR THE SUPPLEMENT TO THE 2013 CALIFORNIA BUILDING AND FIRE CODE EFFECTIVE DATE

July 2014 California became the first state jurisdiction in the nation to adopt and approve the 2011 edition of National Fire Protection Association 2 (NFPA 2 Hydrogen Technologies Code). NFPA 2 is a science based code that provides fundamental safeguards for the generation, installation, storage, piping, use and handling of hydrogen in compressed gas or liquid form. It has undergone intense industry scrutiny and engineering peer review through the rigorous NFPA adoption process.

The adoption of NFPA 2 is part of a larger effort by the State to implement Executive Order B-16-2012 issued to “encourage the development and success of zero-emission vehicles.” The Governor’s Executive Order directs State government to meet a series of milestones toward a long-term target of 1.5 million ZEVs on California’s roadways by 2025.

The Office of the State Fire Marshal through the California Building Standards Commission amended the 2013 California Fire Code (CFC) and California Building Code (CBC) to update and adopt by reference the 2011 Edition of NFPA 2 Hydrogen Technologies Code as part of the intervening code cycle. The amendments and adoption of NFPA 2 will be published in the January 1, 2015 supplement and become effective for statewide application July 1, 2015.

Hydrogen station designs will need to comply with California’s Fire Code, California Code of Regulations, Title 24, Part 9 California Fire Code, and/or the local ordinances. These codes ensure proper setback distances, equipment and mitigation measures for fueling, infrastructure construction, and storage.

This Information Bulletin contains the approved amendments and adoption for the use of NFPA 2 prior to the statewide effective date. Both the CFC and CBC were amended to achieve this adoption. Early use of NFPA 2 and the amendments may be accomplished on a case-by-case basis in accordance the alternate means and methods of construction provisions contained in CFC or CBC Section 1.11.2.4.

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California State Fire Marshal Information Bulletin 14-010

[Amendments made to CCR, Title 24, Part 9 California Fire Code for the incorporation and correlation of NFPA 2 Hydrogen Technologies Code into the California Codes.]

CHAPTER 2 – DEFINITIONS SECTION 202

GASEOUS HYDROGEN SYSTEM. *An assembly of piping, devices and apparatus designed to generate, store, contain, distribute or transport a nontoxic, gaseous hydrogen containing mixture having at least 95- percent hydrogen gas by volume and not more than 1-percent oxygen by volume. Gaseous hydrogen systems consist of items such as compressed gas containers, reactors and appurtenances, including pressure regulators, pressure relief devices, manifolds, pumps, compressors and interconnecting piping and tubing and controls.*

HYDROGEN GAS ROOM. *A room or space that is intended exclusively to house a gaseous hydrogen system.*

CHAPTER 23 – MOTOR FUEL-DISPENSING FACILITIES AND REPAIR GARAGES

2309.3.1.1 Outdoors. Generation, compression, or storage equipment shall be allowed outdoors in accordance with Chapter 58 *and NFPA 2.*

2309.3.1.2 Indoors. Generation, compression, storage and dispensing equipment shall be located in indoor rooms or areas constructed in accordance with the requirements of the *California Building Code, California Mechanical Code* and one of the following: *NFPA 2.*

- ~~1. Inside a building in a hydrogen cutoff room designed and constructed in accordance with Section 421 of the California Building Code.~~
- ~~2. Inside a building not in a hydrogen cutoff room where the gaseous hydrogen system is listed and labeled for indoor installation and installed in accordance with the manufacturer's installation instructions.~~
- ~~3. Inside a building in a dedicated hydrogen fuel dispensing area having an aggregate hydrogen delivery capacity no greater than 12 standard cubic feet per minute (SCFM) and designed and constructed in accordance with Section 703.1 of the California Mechanical Code.~~

2309.4.1 Dispensing Systems. Dispensing systems shall be equipped with an overpressure protection device set at *not greater than* 140 percent of the service pressure of the fueling nozzle it supplies.

~~2344.8–2309.6~~ **Defueling of hydrogen from motor vehicle fuel storage containers.** The discharge or defueling of hydrogen from motor vehicle fuel storage tanks for the purpose of maintenance, cylinder certification, calibration of dispensers or other activities shall be in accordance with Sections ~~2344.8.1~~ *2309.6.1* through ~~2344.8.1.2.4~~ *2309.6.1.2.4.*

~~2344.8.1–2309.6.1~~ **Methods of discharge.** The discharge of hydrogen from motor vehicle fuel storage tanks shall be accomplished through a closed transfer system in accordance with Section ~~2344.8.1.1–2309.6.1.1~~ or an approved method of atmospheric venting in accordance with Section ~~2344.8.1.2~~ *2309.6.1.2.*

~~2344.8.1.1–2309.6.1.1~~ **Closed transfer system.** *(No change to current text)*

~~2344.8.1.2–2309.6.1.2~~ **Atmospheric venting of hydrogen from motor vehicle fuel storage containers.** When atmospheric venting is used for the discharge of hydrogen from motor vehicle fuel storage tanks, such venting shall be in accordance with Sections ~~2344.8.1.2.1–2309.6.1.2.1~~ through ~~2344.8.1.2.4~~ *2309.6.1.2.1.4.*



California State Fire Marshal Information Bulletin 14-010

~~2311.8.1.2.1-2309.6.1.2.1~~ **Defueling equipment required at vehicle maintenance and repair facilities.** All facilities for repairing hydrogen systems on hydrogen fueled vehicles shall have equipment to defuel vehicle storage tanks. Equipment used for defueling shall be listed and labeled or approved for the intended use.

~~2311.8.1.2.1.1-2309.6.1.2.1.1~~ **Manufacturer's equipment required.** Equipment supplied by the vehicle manufacturer shall be used to connect the vehicle storage tanks to be defueled to the vent pipe system.

~~2311.8.1.2.1.2-2309.6.1.2.1.2~~ **Vent pipe maximum diameter.** (No change to current text)

~~2311.8.1.2.1.3-2309.6.1.2.1.3~~ **Maximum flow rate.** (No change to current text)

~~2311.8.1.2.1.4-2309.6.1.2.1.4~~ **Isolated use.** (No change to current text)

~~2311.8.1.2.2-2309.6.1.2.2~~ **Construction documents.** (No change to current text)

~~2311.8.1.2.3-2309.6.1.2.3~~ **Stability of cylinders, containers and tanks.** (No change to current text)

~~2311.8.1.2.4-2309.6.1.2.4~~ **Grounding and bonding.** (No change to current text)

~~2311.8.2-2309.6.2~~ **Repair of hydrogen piping.** Piping systems containing hydrogen shall not be opened to the atmosphere for repair without first purging the piping with an inert gas to achieve 1 percent hydrogen or less by volume. Defueling operations and exiting purge flow shall be vented in accordance with Section ~~2311.8.1.2-2309.6.1.2.~~

~~2311.8.3-2309.6.3~~ **Purging.** (No change to current text)

~~2311.8.3.1-2309.6.3.1~~ **System purge required.** (No change to current text)

2311.8 Defueling equipment required at vehicle maintenance and repair facilities. *Facilities for repairing hydrogen fuel systems on hydrogen-fueled vehicles shall have equipment to defuel vehicle storage tanks. Where work must be performed on a vehicle's fuel storage tank for the purpose of maintenance, repair or cylinder certification, defueling and purging shall be conducted in accordance with Section 2309.6 .*

CHAPTER 53 – COMPRESSED GASES

5301.1 Scope. Storage, use and handling of compressed gases in compressed gas containers, cylinders, tanks and systems shall comply with this chapter, including those gases regulated elsewhere in this code. Partially full compressed gas containers, cylinders or tanks containing residual gases shall be considered as full for the purposes of the controls required.

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see Section 606).
2. Compressed natural gas (CNG) for use as a vehicular fuel shall comply with Chapter 23, NFPA 52 and the *California Mechanical Code*.

Compressed hydrogen (CH₂) for use as a vehicular fuel shall also comply with Chapters 23 and 58 of this code, the California Mechanical Code and NFPA 2.

5305.7 Transfer. Transfer of gases between containers, cylinders and tanks shall be performed by qualified personnel using equipment and operating procedures in accordance with CGA P-1.



California State Fire Marshal Information Bulletin 14-010

Exception: The fueling of vehicles with compressed natural gas (CNG) *or compressed hydrogen gas, that is being conducted in accordance with Chapter 23.*

CHAPTER 58 – FLAMMABLE GASES AND FLAMMABLE CRYOGENIC FLUIDS

5801.1 Scope. The storage and use of flammable gases and flammable cryogenic fluids shall be in accordance with this chapter and NFPA 55. Compressed gases shall also comply with Chapter 53 and cryogenic fluids shall also comply with Chapter 55. Flammable cryogenic fluids shall comply with Section 5806. Hydrogen motor fuel-dispensing stations and repair garages and their associated above-ground hydrogen storage systems shall also be designed, and constructed *and maintained* in accordance with Chapter 23 *and NFPA 2.*

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see Section 606).
2. Liquefied petroleum gases and natural gases regulated by Chapter 61.
3. Fuel-gas systems and appliances regulated under the California Mechanical Code other than gaseous hydrogen systems and appliances.
4. Pyrophoric gases in accordance with Chapter 64.

5802.1 Definitions. The following terms are defined in Chapter 2:

FLAMMABLE GAS.

FLAMMABLE LIQUEFIED GAS.

GASEOUS HYDROGEN SYSTEM.

HYDROGEN GAS ROOM.

METAL HYDRIDE.

METAL HYDRIDE STORAGE SYSTEM.

5803.1.1 Special limitations for indoor storage and use. Flammable gases shall not be stored or used in Group A, E, I or R occupancies or in offices in Group B occupancies.

Exceptions:

1. Cylinders of nonliquefied compressed gases not exceeding a capacity of 250 cubic feet (7.08 m³) or liquefied gases not exceeding a capacity of 40 pounds (18 kg) each at normal temperature and pressure (NTP) used for maintenance purposes, patient care or operation of equipment.
2. Food service operations in accordance with Section 6103.2.1.7.
3. *Hydrogen gas systems located in a hydrogen cutoff room constructed in accordance with Section 421 of the California Building Code.*

SECTION 5808

HYDROGEN FUEL GAS ROOMS

5808.1 General. *Where required by the California Fire Code, hydrogen gas rooms shall be designed and constructed in accordance with Sections 5808.1 through 5808.7 and the California Building Code.*

5808.2 Location. *Hydrogen gas rooms shall not be located below grade.*

5808.3 Design and construction. *Hydrogen gas rooms not exceeding the maximum allowable quantities in Table 5003.1.1(1) shall be separated from other areas of the building in accordance with Section 509.1 of the California Building Code.*

5808.3.1 Pressure control. *Hydrogen gas rooms shall be provided with a ventilation system designed to maintain the room at a negative pressure in relation to surrounding rooms and spaces.*

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California State Fire Marshal Information Bulletin 14-010

5808.3.2 Windows. Operable windows in interior walls shall not be permitted. Fixed windows shall be permitted where in accordance with Section 716 of the California Building Code.

5808.4 Exhaust Ventilation. Gas rooms shall be provided with mechanical exhaust ventilation in accordance with the applicable provisions of the California Mechanical Code.

5808.5 Gas detection system. Hydrogen gas rooms shall be provided with an approved flammable gas detection system in accordance with Sections 5808.5.1 through 5808.5.4.

5808.5.1 System design. The flammable gas detection system shall be listed for use with hydrogen and any other flammable gases used in the room. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammability limit (LFL) for the gas or mixtures present at their anticipated temperature and pressure.

5808.5.2 Gas detection system components. Gas detection system control units shall be listed and labeled in accordance with UL 864 or UL 2017. Gas detectors shall be listed and labeled in accordance with UL 2075 for use with the gases and vapors being detected.

5808.5.3 Operation. Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals both inside and outside of the gas room.
2. Activation of the mechanical exhaust ventilation system.

5808.5.4 Failure of the gas detection system. Failure of the gas detection system shall result in activation of the mechanical exhaust ventilation system, cessation of hydrogen generation and the sounding of a trouble signal in an approved location.

5808.6 Explosion control. Explosion control shall be provided where required by Section 911.

5808.7 Standby power. Mechanical ventilation and gas detection systems shall be connected to a standby power system in accordance with Chapter 6.

CHAPTER 80 – REFERENCED STANDARDS

NFPA National Fire Protection Association
 1 Batterymarch Park
 Quincy, MA 02269-9101

Standard reference number	Title	Referenced in code section number
<u>2-11</u>	<u>Hydrogen Technologies Code</u>	<u>2309.3.1.1,</u> <u>309.3.1.2</u>



California State Fire Marshal Information Bulletin 14-010

[Amendments made to CCR, Title 24, Part 2 California Building Code for the incorporation and correlation of NFPA 2 Hydrogen Technologies Code into the California Codes.]

CHAPTER 2 – DEFINITIONS SECTION 202

HYDROGEN CUTOFF-FUEL GAS ROOM. A room or space that is intended exclusively to house a gaseous hydrogen system.

SECTION 421 HYDROGEN CUTOFF-FUEL GAS ROOMS

421.1 General. Where required by the International Fire Code, hydrogen cutoff-fuel gas rooms shall be designed and constructed in accordance with Sections 421.1 through 421.8.

421.2 Definitions. The following terms are defined in Chapter 2:

GASEOUS HYDROGEN SYSTEM HYDROGEN CUTOFF-FUEL GAS ROOM.

421.3 Location. Hydrogen cutoff-fuel gas rooms shall not be located below grade.

421.4 Design and construction. Hydrogen cutoff-fuel gas rooms *not classified as Group H* shall be classified with respect to occupancy in accordance with Section 302.1 and separated from other areas of the building in accordance with Section 509.1 by not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both; or as required by Section 508.2, 508.3 or 508.4, as applicable—.

421.4.1 Opening protectives-Pressure control. Doors within the fire barriers, including doors to corridors, shall be self-closing in accordance with Section 716. Interior door openings shall be electronically interlocked to prevent operation of the hydrogen system when doors are opened or ajar or the room shall be provided with a mechanical exhaust ventilation system designed in accordance with Section 421.4.1.1. *Hydrogen gas rooms shall be provided with a ventilation system designed to maintain the room at a negative pressure in relation to surrounding rooms and spaces.*

421.4.1.1 Ventilation alternative. Where an exhaust system is used in lieu of the interlock system required by Section 421.4.1, exhaust ventilation systems shall operate continuously and shall be designed to operate at a negative pressure in relation to the surrounding area. The average velocity of ventilation at the face of the door opening with the door in the fully open position shall not be less than 60 feet per minute (0.3048 m/s) and not less than 45 feet per minute (0.2287 m/s) at any point in the door opening.

421.5 Exhaust Ventilation. Cutoff-Gas rooms shall be provided with mechanical exhaust ventilation in accordance with the applicable provisions for repair garages in Chapter 5 of the *California Mechanical Code*.

421.6 Gas detection system. Hydrogen cutoff-fuel gas rooms shall be provided with an approved flammable gas detection system in accordance with Sections 421.6.1 through 421.6.3-421.6.4.



California State Fire Marshal Information Bulletin 14-010

421.6.2 Gas detection system components. *Gas detection system control units shall be listed and labeled in accordance with UL 864 or UL 2017. Gas detectors shall be listed and labeled in accordance with UL 2075 for use with the gases and vapors being detected.*

421.6.2-421.6.3 Operation. Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals both inside and outside of the ~~cutoff~~ fuel gas room.
2. Activation of the mechanical exhaust ventilation system.

421.6.3-421.6.4 Failure of the gas detection system. Failure of the gas detection system shall result in activation of the mechanical exhaust ventilation system, cessation of hydrogen generation and the sounding of a trouble signal in an approved location.

421.7 Explosion control. *Explosion control shall be provided in accordance with Chapter 9 of the California Fire Code where required by Section 414.5.1.*

**TABLE 509
INCIDENTAL USES**

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Hydrogen cutoff <u>fuel gas</u> rooms, not classified as Group H	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.

Other questions or comments regarding this Information Bulletin should be directed to Kevin Reinertson, Regulations Coordinator at (916) 327-4998, or by electronic mail to kevin.reinertson@fire.ca.gov.