Corona Fire Department

Compressed Gas Guideline
Per 2019 California Fire Code

PURPOSE

The intent of this guideline is to provide the information necessary to ensure that the design and installation of compressed gas containers, cylinders, tanks, and systems will comply with the applicable provisions of the 2019 California Fire Code (CFC) Chapters 50 & 53 and NFPA 55, material specific provisions, and permit requirements, as specified by the 2019 CFC.

SCOPE

This guideline is applicable to storage, use, and handling of compressed gases in compressed gas containers, cylinders, tanks, and systems. Partially full compressed gas containers, cylinders, or tanks containing residual gases shall be considered as full for the purpose of the controls required.

- Liquefied natural gas for use as a vehicular fuel shall also comply with NFPA 52 nd NFPA 59A.
- Compressed gases classified as hazardous materials shall also comply with CFC Chapter 50 for general requirements and chapters addressing specific hazards, including Chapters 58 (Flammable Gases), 60 (Highly Toxic and Toxic Materials), 63 (Oxidizers, Oxidizing Gases and Oxidizing cryogenic Fluids) and 64 (Pyrophoric Materials).
- Compressed hydrogen for use as a vehicular fuel shall also comply with Chapters 23 and 58 of the CFC, the California Mechanical Code and NFPA 2.
- Cutting and welding gases shall also comply with Chapter 35.
- LP-gas shall comply with CFC Chapter 61 and the California Mechanical Code.
  Exceptions:
  1. Gases used as refrigerants in refrigeration systems (see CFC 605).
  2. Compressed natural gas (CNG) for use as a vehicular fuel shall comply with CFC Chapter 23, NFPA 52 and the California Mechanical Code.
  3. Cryogenic fluids shall comply with CFC Chapter 55.

PERMITS

1. Permits are required by the California Fire Code, Section 105.6, to store, transport on site, dispense, use, or handle compressed gases in excess of the quantities specified in CFC Table 105.6.8, below:

Table 105.6.8 Permit Amounts for Compressed Gases

Type of Gas	Permit Amount (cubic feet at NTP)
Carbon Dioxide used in carbon dioxide enrichment systems	875 (100 lbs.)
Carbon Dioxide used in insulated liquid carbon dioxide beverage dispensing applications	875 (100 lbs.)
Corrosive	200
Flammable (except cryogenic fluids and LPG)	200
Highly Toxic	Any amount
Inert and simple asphyxiant[1]	6000
Oxidizing (including oxygen)	504
Pyrophoric	Any amount
Toxic	Any amount

- *Exception: Vehicles equipped for and using compressed gas as a fuel for propelling the vehicle.*

[1] For carbon dioxide used in beverage dispensing applications, see CFC Section 105.6.4, included in this guideline

2. Applicant shall furnish the required information to the Fire Department, prior to delivery of compressed gas to the business. Initial permit issuance shall be reviewed as a tenant improvement and detailed plans shall be submitted to the Corona Fire Department for review processing. Any changes in quantity of compressed gas, type of gas or change to a process shall be reviewed and approved by the Corona Fire Department, prior to any on-site changes. Plans shall include the following *minimum* details; additional details may be required by the Fire Department after initial review of the proposed use:

   a. A site plan on 8 ½" X 11" paper(s)(minimum), which contains:
      - Floor plan of the building showing where gas is to be installed, distributed, or stored
      - *Identification* of the type of gas, the *quantity* in cubic feet, and the type of storage containers
      - Adequate separation of incompatible products
      - The location of the storage containers, both full and empty
      - The piping design plan identifying routing of pipe and labeling of piping
      - Location of shut off valves and discharge points
      - Location and type of alarm system(s)
      - Any gas cylinder storage room, including construction type, doors, and ventilation
      - Method of securing cylinders from accidental dislodgment or unauthorized access

3. When the amount of compressed gas exceeds 200 cubic feet per type of gas (except inert gas, see below), a **Hazardous Materials Business Emergency Plan and Chemical Inventory** disclosure shall be required to be submitted electronically through the California Electronic Reporting System (CERS) at https://cers.calepa.ca.gov , per Corona Municipal Code and California Code of Regulations. When compressed gases are permitted as hazardous materials in conjunction with the hazardous materials disclosure program, the required Fire Code permits shall be issued at no cost, provided that the Riverside County Department of Environmental Health, Hazardous Material permit is current.

4. Inert compressed gases are reportable to CERS at quantities equal to or greater than 1000 cf.

5. Permits for the *use* of the compressed gas, i.e. hot works permit required by CFC 105.6 shall be issued separately from compressed gas permits. A permit fee for the welding/hot works permit is required, along with a site plan and permit application. The CFC permit application is available at www. coronaca.gov .

General Requirements CFC 5303

1. Compressed gas containers, cylinders and tanks shall be designed, fabricated, tested and marked with the specifications of manufacture and maintained in accordance with regulations of DOTn 49 CFR, Parts 100-185 or the *ASME Boiler and Pressure Vessel Code*, Section VIII. Compressed gas cylinders shall be clearly labeled with the name of the gas. Piping systems shall be marked with the content's name and the direction of flow. Markings are required at each valve; at wall, floor or ceiling penetrations; at each change of direction; and at a minimum of every 20' or fraction thereof throughout the piping run.

2. Compressed gas containers, cylinders, tanks, and systems shall be secured to prevent falling from contact, vibration, or seismic activity, by one of the following methods:

   a. Securing one or more to a fixed object with one or more restraints
   b. Securing containers on a cart or other mobile device designed for specific use
   c. Nesting of cylinders at container filling or servicing facilities or in seller's warehouses which are not accessible to the public
   d. Securing containers to or within a rack, framework, cabinet, or similar assembly designed for such use

3. Compressed gas container, cylinder, and tank valves shall be protected from physical damage by means of protective caps, collars, or similar devices. Guard posts or other approved means shall be provided to protect compressed gas containers, cylinders, tanks and systems indoors and outdoors

from vehicular damage. Valve protection devices such as caps, collars or similar devices shall be maintained in place.

4. Compressed gas containers, cylinders, tanks, and systems shall be separated from materials and conditions that present exposure hazards and from incompatible materials. Containers shall not be exposed to corrosive chemicals or fumes, which could damage containers and/or valves.

5. Pressure relief devices shall be provided to protect containers, cylinders and tanks containing compressed gases from rupture in the event of overpressure in accordance with CFC 5303.3.1.

6. Combustible waste, vegetation, and similar materials shall be kept a minimum of 10' from containers, cylinders, tanks, and systems. A noncombustible partition, without openings or penetrations and extending not less than 18 inches above and to the sides of the storage area is allowed in lieu of such distance.

7. Compressed gas containers, cylinders, and tanks shall not be placed near elevators or unprotected platform ledges where they may fall. Cylinders shall not be placed in areas where they are likely to be damaged from falling objects.

8. Compressed gas containers, cylinders, and tanks shall not be exposed to temperatures exceeding 125° F, or subambient temperatures, unless designed for use under the exposed conditions. Devices designed to maintain containers at constant temperature shall be approved and be designed to be failsafe. When cylinders are stored where extreme temperatures prevail, overhead covers shall be provided.

9. To prevent bottom corrosion, containers, cylinders, and tanks are to be protected from direct contact with soil or unimproved surfaces. The area where cylinders are located shall be graded to prevent accumulation of water.

10. Leaking, damaged or corroded containers, cylinders and tanks are to be removed from service and handled in an approved manner. Containers that have been exposed to fire shall also be removed from service and handled by approved qualified persons.

11. Systems, containers, cylinders, tanks, piping, tubing, valves, fittings, and related components shall be designed and constructed in accordance with nationally recognized standards, and shall be of an approved type.

12. Piping, tubing, valves, fittings, and related components shall be fabricated from materials compatible with the material to be contained, and of adequate strength and durability to withstand the pressure, structural and seismic stress, and exposure to which they are subject.

13. Emergency shut-off valves shall be identified and location shall be clearly visible and indicated by means of a sign.

14. Areas for the storage, use, and handling of compressed containers, cylinders, tanks, and systems shall be safeguarded from unauthorized entry and secured with such protective facilities as public safety requires.

15. Emergency shutoff for flammable, oxidizing and pyrophoric gases shall be provided at each point of use and at each source.

Storage CFC 5304

1. Compressed gas containers, cylinders, and tanks shall be maintained in an upright, "valve end up" position, unless designed for use in a horizontal position. At cylinder filling operations and seller's warehouses, tightly stacked horizontal storage is considered an equivalent safe method of storage.

2. Additional material specific requirements shall comply with the material specific provisions of CFC Chapters 54, 58, 60 through 67.

For requirements pertaining to locations, detection, suppression, exposures, distances, ventilation and other specific provisions, see the material specific chapters noted above.

Use and Handling CFC 5305

1. Compressed gas systems shall be suitable for the use intended and shall be designed by persons competent in such design. Compressed gas equipment, machinery and processes shall be listed or approved.

2. Compressed gas system controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate, or path. Automatic controls shall be designed to be failsafe.

3. Piping, tubing, pressure regulators, valves, and other apparatus shall be kept gas-tight to prevent leakage.

4. Valves shall be suitable for the use intended and shall be accessible. Valve handles or operators for required shut-off valves shall not be removed or altered to prevent access.

5. Venting of gases shall be directed to an approved location in accordance with the Mechanical Code.

6. Compressed gas containers, cylinders, tanks, except those designed for use in a horizontal position, shall be used in a “valve upright” position. An upright position shall include conditions where the container is inclined as much as 45 degrees from vertical.

7. Gases used for inflatable equipment, devices, or balloons shall be inert or shall be compressed air.

8. Handling of containers, tanks, and cylinders shall be by an approved method, including hand cart, hand truck, or other mobile devices designed for the secure movement of containers. Ropes, chains, or slings shall not be used to suspend containers, cylinders or tanks, unless the manufacturer has provided appropriate lifting attachments such as lugs. Carts or trucks used for transporting cylinders shall be designed so that cylinders and tanks are secured from dropping and will not strike against each other, or other surfaces.

Medical Gas Systems CFC 5306

1. Medical gases at health care-related facilities intended for patient care, inhalation or sedation including but not limited to, analgesia systems for dentistry, podiatry, veterinary and similar uses shall comply with CFC Sections 5306.2 through 5306.5, in addition to other requirements of CFC Chapter 53.

2. Medical gases shall be stored in areas dedicated to the storage of such gases, and without any other storage or use. When quantities are greater than the permit amount from Table 105.6.8, the cylinders, containers or tanks shall be in one of the following:

    a. One-hour exterior room per CFC 5306.2.1
    b. One-hour interior room per CFC 5306.2.2
    c. Gas cabinet per CFC 5306.2.3

3. Rooms or areas where medical gases are stored or used in quantities exceeding the Maximum Allowable Quantities per control area shall be in accordance with the CA Building Code for Group H occupancies.

4. The following construction provisions for storage of medical gases in quantities exceeding the permit amounts shall apply:

a. **One-hour exterior rooms**. A 1-hour exterior room shall be a room or enclosure separated from the remainder of the building by fire barriers with a fire resistance rating of not less than 1 hour. Openings between the room or enclosure and interior spaces shall be self-closing smoke and draft control assemblies having a fire protection rating of not less than 1 hour. Rooms shall have at least one exterior wall, which contains at least two nonclosable louvered vents. Each vent shall have a minimum free opening area of 24 square inches for each 1000 cubic feet at normal temperature and pressure of gas stored in the room and shall be not less than 72 square inches in aggregate free opening area. One vent shall be within 6" of the floor and one within 6" of the ceiling. Rooms shall be provided with at least one automatic sprinkler to provide container cooling in case of fire.

b. **One-hour interior rooms**. When an exterior wall cannot be provided for the room, automatic sprinklers shall be installed within the room. The room shall be exhausted through a duct to the exterior. Supply and exhaust ducts shall be enclosed in a 1-hour rated shaft enclosure from the room to the exterior. Approved mechanical ventilation shall comply with the *California Mechanical Code* and be provided at a minimum rate of 1 cubic foot per minute per square foot of the area of the room.

c. **Gas cabinets.** Gas cabinets shall be constructed per CFC 5003.8.6 and the following:

    1. The average velocity of ventilation at the face of access ports or windows shall not be less than 200 feet per minute with a minimum of 150 feet per minute at any point of the access port or window.
    2. They shall be connected to an exhaust system.
    3. They shall be internally sprinklered.

d. **Exterior supply locations.** Oxidizer medical gas systems located on the exterior of a building with quantities greater than the permit amount shall be located in accordance with CFC 6304.2.1.

e. **Medical gas systems**, including, but not limited to, distribution piping, supply manifolds, connections, pressure regulators, and relief devices shall comply with NFPA 99 and the general provisions of CFC Chapter 53. Existing medical gas systems shall be maintained in accordance with the maintenance, inspection and testing provisions of NFPA 99 for medical gas systems.

f. **Transfilling** areas and operations including, but not limited to, ventilation and separation, shall comply with NFPA 99.

Compressed Gases not Otherwise Regulated CFC 5307

1. Carbon dioxide systems with more than 100 pounds of carbon dioxide used in beverage dispensing applications shall comply with CGC 5304.1 through CFC 5307.4.7.

2. Permits shall be required as set forth in CFC Section 105.6.

3. The storage, use and handling of liquid carbon dioxide shall be in accordance with CHC Chapter 53 and the applicable requirements of NFPA 55, Chapter 13. Insulated liquid carbon dioxide systems shall have pressure relief devices vented in accordance with NFPA 55.

4. Carbon dioxide systems shall be installed so the storage tanks, cylinders, piping and fittings are protected from damage by occupants or equipment during normal facility operations.

5. Where carbon dioxide storage tanks, cylinders, piping and equipment are located indoors, rooms or areas containing carbon dioxide storage tanks, cylinders, piping and fittings and other areas where a leak of carbon dioxide can collect shall be provided with either ventilation in accordance with CFC 5004.3 or an emergency alarm system in accordance with CFC 5307.3.2.

   Ventilation. Mechanical ventilation shall be in accordance with the California Mechanical Code and shall comply with all of the following:

- Mechanical ventilation in the room or area shall be at a rate of not less than 1 cubic foot per minute per square foot.
- Exhaust shall be taken from a point within 12 inches of the floor.
- The ventilation system shall be designed to operate at a negative pressure in relation to the surrounding area.

Emergency alarm system. An emergency alarm system shall comply with all of the following:

- Continuous gas detection shall be provided to monitor areas where carbon dioxide can accumulate.
- The threshold for activation of an alarm shall not exceed 5000 ppm.
- Activation of the emergency alarm system shall initiate a local alarm within the room or area in which the system is installed.

1. Compressed gases in storage or use not regulated by the material specific provisions of Chapters 6, 54, 55, and 60 through 67, including asphyxiant, irritant and radioactive gases shall comply with CFC 5307 and Chapter 53.

2. Indoor storage and use areas and storage buildings shall be provided with mechanical exhaust ventilation or natural ventilation in accordance with Chapter 50. When mechanical ventilation is provided, the systems shall be operational when the building or space is occupied.

Additional Information

CA Code of Regulations, Title 19, Division 1, §3.18(a) and (b) Hazardous Areas.

(a) ***General.*** *Occupancies or portions thereof used or intended to be used as operating rooms, surgeries, delivery rooms, storage rooms and similar hazardous locations in which flammable and nonflammable mixtures of gases are used or stored shall be maintained in accordance with the provisions of NFPA 99-2005 Inhalation Anesthetics, NFPA 99-2005 Laboratories, NFPA 99-2005 Hyperbaric Facilities, NFPA 55-2010 Bulk Oxygen Systems at Consumer Sites, and this section.*

(b) ***Containers.*** *Cylinders and fittings shall be clearly marked with the name of the gas contained therein. Cylinders shall bear color markings and labels conforming to the following:*

Gas	*Color*
(1) Oxygen	*Green*
(2) Carbon Dioxide	*Gray*
(3) Nitrous Oxide	*Light Blue*
(4) Cyclopropane	*Orange*
(5) Helium	*Brown*
(6) Ethylene	*Red*
(7) Carbon Dioxide and Oxygen	*Gray and Green*
(8) Helium and Oxygen	*Brown and Green*

Note: Polished metal or chrome-plated cylinders shall have color tags in addition to color labels.