

# CARBON DIOXIDE SYSTEMS FOR BEVERAGE DISPENSING PERMIT REQUIREMENTS



**Town of Darien  
Code Enforcement Office**

January 2019

# Carbon Dioxide Systems for Beverage Dispensing Requirements

## Scope

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 2015 Fire Code of New York State Chapters 50 & 53 and NFPA 55, material specific provisions, and permit requirements, as specified by the 2015 Fire Code of New York State.

## Purpose

Carbon Dioxide, CO<sub>2</sub>, is a colorless odorless gas that asphyxiates by displacing oxygen in the air. Several fatal carbon dioxide incidents have occurred in restaurants where CO<sub>2</sub> leaked from large storage tanks serving carbonated beverage dispensers. These incidents led to the additional permitting and detection requirements for large CO<sub>2</sub> storage tanks being added to the 2015 Fire Code of New York State.

## Definitions

**Asphyxiation:** to lose consciousness by impairing normal breathing, to suffocate or smother

**Dewar:** a vacuum flask that holds a cryogenic or liquefied gas

**Carbon Dioxide (CO<sub>2</sub>) Detector:** a device to measure the concentration of CO<sub>2</sub> in the air

**Carbon Dioxide (CO<sub>2</sub>):** Rooms or areas sheltered from the weather with a roof and enclosed on two or more sides with a solid wall. Subject to review by the code official, rooms or areas without a roof and with solid walls and doors on all sides, may be considered an indoor installation.

**Liquid Carbon Dioxide (CO<sub>2</sub>) Systems:** An assembly of equipment consisting of one or more carbon dioxide supply containers, interconnecting piping, pressure regulators, and pressure relief devices

**PEL:** Permissible Exposure Limit for CO<sub>2</sub> gas is 5,000 PPM (0.5%) Time Weighted Average (TWA) @ 8 hours a day, 40 hours per week


**STEL:** Short-Term Exposure Limit for CO<sub>2</sub> is 30,000 PPM (3.0%) for less than 15 minutes

**IDLH:** Immediately Dangerous to Life & Health for CO<sub>2</sub> is 40,000 PPM (4.0%)

## Carbon Dioxide Conversion Tables / Hazard Characteristics

Product Name	Cubic Feet/Pound	Pounds/Gallon	Cubic Feet/Gallon
Carbon Dioxide (CO <sub>2</sub> ) CAS: 124-38-9	8.74	8.46	73.94

**Carbon Dioxide**  
Colorless compressed gas.  
Simple asphyxiant  
(reduces oxygen available  
for breathing).  
Eye/skin contact with the  
compressed gas can  
cause frostbite.



CAS No. 124-38-9

## Reporting Conditions

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1. An operational permit is required for carbon dioxide systems used in beverage dispensing applications having more than 100 pounds of carbon dioxide. The 100 lbs. refers to the total CO<sub>2</sub> in use and stored within a building. Systems with more than 100 lbs. total in use and stored within the building shall require a permit, protection from damage, and detection or ventilation

For purposes of inspection and enforcement the following interpretations of the requirements will be applied:

- Any tank(s) in-use or stored within a building **will** count towards the 100 lb. threshold.
  - Any tank(s) in-use outside the building **will** contribute towards the 100 lb. threshold.
  - If one 100 lb. CO<sub>2</sub> tank is located inside the building and connected to the system and in use, but two more 100 lb. CO<sub>2</sub> tanks are stored inside, in the same or other location, a permit and ventilation or alarms are required
2. 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.
  3. Where carbon dioxide supply tanks, cylinders, piping, and equipment are located indoors, rooms or areas containing carbon dioxide supply tanks, cylinders, piping and fittings and other areas where a leak of a carbon dioxide system can collect, shall be provided with either ventilation **OR** an emergency alarm system as follows:
    - 3.1 **Ventilation**. Mechanical ventilation shall be in accordance with the International Mechanical Code and shall comply with all the following:
      - a. Mechanical ventilation in the room or area shall be at a rate of not less than 1 cubic foot per minute per square foot.
      - b. Exhaust shall be taken from a point within 12 inches of the floor.
      - c. The ventilation system shall be designed to operate at a negative pressure in relation to the surrounding area.
      - d. Ventilation shall run continuously or be activated by a sensor or detector to maintain an atmosphere of less than 5,000 ppm.
    - 3.2 **Emergency alarm system**. An emergency alarm system shall comply with all the following:
      - a. If emergency alarms are chosen as the method of protection and compliance, continuous CO<sub>2</sub> detection is required in areas where CO<sub>2</sub> can accumulate.
      - b. The threshold for activation of an alarm shall not exceed 5,000 parts per million.
      - c. Activation of the emergency alarm system shall initiate a local audible alarm within the room or area in which the system is installed.
      - d. Gas detection equipment shall be installed, calibrated, maintained and replaced in accordance with the manufacturer's instructions. The manufacturer's instructions together with calibration and maintenance records shall be posted in the immediate vicinity of the gas detection equipment.
  4. Pressure relief devices shall be piped to the outdoors where the discharge will not impinge on the structure, personnel, or means of egress and will not create a hazardous concentration of carbon dioxide.

Vent piping systems serving pressure relief devices shall be protected from water intrusion to prevent moisture or solid carbon dioxide from collecting and freezing and interfering with the operation of the pressure relief device.

Carbon dioxide can form dry ice, which can accumulate and block the vent line. Chances of this can be enhanced if a pressure relief device is located too close to the container.

## Signage

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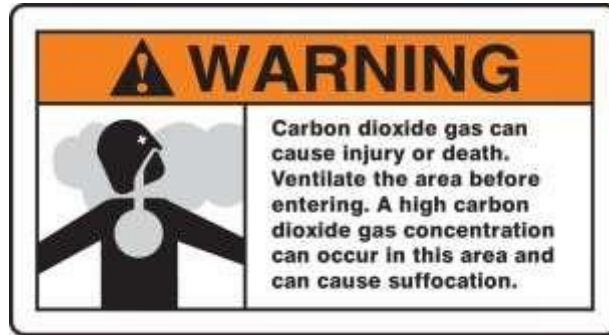
A warning sign shall be posted at the entrance to the building, room, enclosure, or confined area where the container is located.

The warning sign shall be at least 8 inches wide and 6 inches high and state the following:

**CAUTION — CARBON DIOXIDE GAS.**

Ventilate the area before entering.

A high carbon dioxide (CO<sub>2</sub>) gas concentration in this area can cause suffocation.



Provide a graphic floor plan map of the area protected by the CO<sub>2</sub> emergency alarm system that is permanently mounted adjacent to the Carbon Dioxide (CO<sub>2</sub>) Emergency Alarm.

Plans shall be of durable construction, easily readable in normal lighting, protected by a smooth, transparent, plastic surface and shall indicate the location of supply tank, points of use, and CO<sub>2</sub> detectors. The graphic map shall state "You Are Here" and be properly oriented to assist the responding fire fighters.

Rooms equipped with carbon dioxide sensors/alarms, must display signage at the entrance to the room that warns occupants not to enter when alarms are activated.

Exterior signs to be located adjacent to rear/side maintenance door. CO<sub>2</sub> letters to be mounted on exterior tank fill connection protective door. CO<sub>2</sub> Letters to be 3-inches in size (Subscript size for number 2 is optional). Letters shall contrast with background.



## Training

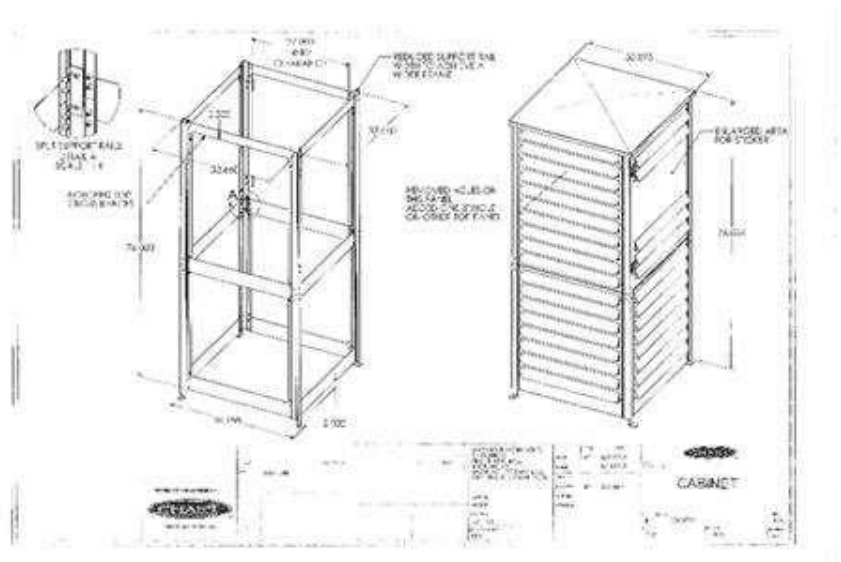
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Persons responsible for the operation of areas in which hazardous materials are stored, dispensed, handled or used shall be familiar with the chemical nature of the materials and the appropriate mitigating actions necessary in the event of a fire, leak or spill. Responsible persons shall be designated and trained to be liaison personnel for the fire department. These persons shall aid the fire department in preplanning emergency responses and identification of where hazardous materials are located and shall have access to Material Safety Data Sheets and be knowledgeable in the site emergency response procedures. (FCNYS – Section 407.4)

# CARBON DIOXIDE (CO<sub>2</sub>) OUTDOOR STORAGE

## For Exterior Carbon Dioxide Systems of One or More Containers of 100 Pounds or Greater

- Shall be above grade.
- Shall not be obstructed by more than three sides of the perimeter with supports and walls.
- Shall not be installed within 10 feet of elevators, unprotected platform ledges or other areas where falling would result; shall not be installed on roofs, shall not be installed with 36 in of electrical panels.
- Shall be safely supported; vessel foundation must be capable of supporting the full system weight.
- Supply line shall be UV resistant or protected conduit or appropriate covering.
- Shall be equipped with isolation valves installed on the fill line and tank discharge or gas supply line. They shall be designed/marked to indicate open or closed, shall be accessible, clearly marked or identified, and capable of being locked or tagged in closed position for servicing.
- When extreme temperatures prevail, overhead covers shall be provided. Compressed gas containers, cylinders and tanks, whether full or partially full, shall not be exposed to artificially created high temperatures exceeding 125°F or sub-ambient (low) temperatures unless designed for use under the exposed conditions.
- Areas used for the storage, use and handling of compressed gas containers, cylinders, tanks and systems shall be secured against unauthorized entry and safeguarded in an approved manner. (i.e. fence, expanded metal cage or cabinet).
- Guard posts or other approved means shall be provided to protect compressed gas containers, cylinders, tanks and systems indoors and out-doors from vehicular damage and shall comply with 2015 Fire Code of New York State - Section 312.
- Labeling - An NFPA 704 compliant Hazard Placard is required. This requirement is subject to verification at the time of the fire safety Inspection prior to issuance of an operational permit. Additional hazard warning signage specific to the material is required.



## Liquid Carbon Dioxide Systems

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Containers employed for storage or use of cryogenic fluids shall comply with Sections 5503.1.1 through 5503.1.3.2 and Chapter 50.

### Piping and Fittings

Piping systems shall be identified in accordance with ASME A13.1.

Identification. Markings for carbon dioxide (CO<sub>2</sub>) piping systems shall consist of the content's name (carbon dioxide or CO<sub>2</sub>) and direction-of-flow arrow. Markings shall be provided at each valve; at wall, floor, or ceiling penetrations; at each change of direction; and at not less than every 20 feet or fraction thereof throughout the piping run.

Piping, tubing, pressure regulators, valves, and other apparatus shall be kept gastight to prevent leakage.

A soap test of all joints will be conducted at the time of inspection by the building owner or contractor and witnessed by the Office of the Fire Marshal.

### Pressure Relief Valves

Containers, cylinders, and tanks shall be provided with a pressure gauge and a level gauge or device for indicating the quantity of liquid carbon dioxide.

These devices shall be designed for the temperatures and pressures associated with liquid carbon dioxide service.

Where containers, cylinders, and tanks are in locations remote from the filling connection, a means to determine when the containers have been filled to their design capacity shall be provided and shall be verifiable from the filling connection.

### Emergency Shut Off

Emergency shutoffs shall be located at the point of use and at the tank, cylinder, or bulk source. These shutoffs shall be clearly marked. When hazardous materials are stored outside of buildings in stationary above-ground tanks or pressure vessels and are piped into a building, an emergency shutoff valve shall be installed at an approved location outside of the building. (NFPA 55, 7.1.11.1 and 7.1.11.2).

### Securing of Containers

Stationary containers shall be secured to foundations in accordance with the 2015 Building Code of New York State. Portable containers subject to shifting or upset shall be secured. Nesting shall be an acceptable means of securing containers

### Lighting

When required, lighting, including emergency lighting, shall be provided for fire appliances and operating facilities such as walkways, control valves and gates ancillary to stationary containers.

## Construction Drawings Requirements for New Carbon Dioxide for Beverage Dispensing Systems

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Construction permits are required to install, repair damage to, abandon, remove, place temporarily out of service or close or substantially modify Carbon Dioxide (CO<sub>2</sub>) systems with more than 100 pounds (45.4 kg) of Carbon Dioxide (CO<sub>2</sub>) in use or storage or any combination thereof.

Construction drawings and specifications shall be complete and of enough clarity to indicate the entire work proposed and show in detail that the Carbon Dioxide (CO<sub>2</sub>) system conforms to the provisions of the Fire and Building Codes of New York State and relevant laws, ordinances, rules, and regulations.

Construction or Shop Drawings shall be submitted for review and approval, **PRIOR** to installation.

No CO<sub>2</sub> beverage dispensing systems shall be installed on the site until a Fire Code Operational Permit has been issued.

Any work performed prior to the issuance of this Fire Code Operational Permit may result in a citation being issued for violation of Section 108.8 of the 2015 Fire Code of New York State, referring to the 2017 New York State Code Supplement.

If work is found to have commenced without approved plans and/or a proper permit, this office reserves the right to shut down any/all portions of the entire project deemed necessary to inspect, investigate and confirm that work has been done. All plan review and permit **fees immediately double** for working without a permit.

Each set of drawings and specifications shall, at a minimum, contain the following information, architectural, structural, mechanical, electrical drawings, specifications, and analysis:

- Drawings shall be generated by the installing company specific to the installation and shall not be copied.
- Plans shall be dimensioned and scaled.
- Floor plan of the building showing where gas is to be installed, distributed, or stored and location(s) of all means of egress (exits).
- The location of the storage containers, both full and empty.
- Identification of the type of gas, the quantity in cubic feet and pounds, and the type of storage containers.
- Adequate separation of incompatible products.
- A full equipment listing including manufacturer specifications include all UL or NRTL listings and evaluations for all parts and materials used in the project.
- The piping design plan identifying routing of pipe and method of labeling of piping as per ANSI A13.1.
- Location of shut off valves, relief valves and discharge points.
- Design pressure, maximum operating pressure and test pressure.
- Type, size and setting of pressure relief devices.
- 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.
- Location of warning signs. Details for warning signs such as text, size, color and attachment method.
  - NFPA 704 Diamond
  - Caution – Carbon Dioxide Gas

Permit applications submitted without the required information listed above may be returned and/or not accepted. Permit applications, including required plans and supplemental information must be submitted to the Office of the Fire Marshal a minimum of five working days prior to the desired inspection date. Failure to do so may cause system start up and use to be delayed until the permit is acceptable. The applicant will be notified either by phone and/or email the status of the application once the review has been completed.