

# REFERENCE MEMORANDUM FOR CARBON DIOXIDE (CO<sub>2</sub>) SYSTEMS



## SCOPE

This policy covers the safety requirements as they pertain to the use of Carbon Dioxide (CO<sub>2</sub>) gas systems using or storing more than 100 pounds of CO<sub>2</sub>; or as otherwise outlined in the 2015 International Fire Code (IFC) Section 5307 with Washington amendments and NFPA 55. These requirements shall apply to new and existing systems; as well as storage only facilities.

## DEFINITIONS

A "CO<sub>2</sub> system" where otherwise not specified shall be defined as including the CO<sub>2</sub> tank, piping and connections, ventilation and alarm systems when applicable.

Where "sensor" is used it is assumed to be a Non-Dispersive Infrared (NDIR) sensor with a built in audible signaling alarm.

## EQUIPMENT

The storage, use and handling of CO<sub>2</sub> shall be in accordance with Chapter 53 of the IFC and applicable requirements of NFPA 55, Chapter 13.

## INSTALLATION

Installation shall be done by a professional. CO<sub>2</sub> systems and ALL their components shall be located in approved locations. The installer shall provide the following information to the authorities having jurisdiction (AHJ) for approval:

- A detailed drawing on a floor plan showing the location of the CO<sub>2</sub> tank, plumbing, connections, filling point and pressure relief venting point.
- If mechanical ventilation is used in accordance with IFC 5307.5.1 a detailed drawing showing the location of the exhaust ventilation will be provided.
  - Provide mechanical ventilation system information and calculations.
  - Exhaust shall be taken from a point within 12 inches from the floor.
- If an emergency alarm gas detection system is used in accordance with IFC 5307.5.2
  - A detailed floorplan showing the location of CO<sub>2</sub> monitoring sensors, strobes and other components.
  - Provide CO<sub>2</sub> monitoring equipment information manual and specification sheets.
  - The threshold for activation of an alarm shall not exceed 5,000 parts per million (ppm).

### **EQUIPMENT INSTALLATION GUIDELINES**

1. Installation of an emergency alarm gas detection system shall be, *at a minimum*, installed according to manufacturer's specifications if not otherwise specified hereinafter.
2. Use of Automatic Background/Baseline Calibration (ABC) sensors shall be prohibited.<sup>1</sup>
3. If not specified by the manufacturer, one sensor shall be required for up to 2,000 square feet of floor area. Where the protected space exceeds 2,000 square feet of floor area, additional sensors may be installed so that one sensor is installed for every 2,000 square feet of floor space required to be protected.
4. Sensors shall be installed no more than eighteen inches (18") from the floor.
5. Sensors shall be installed no more than ten feet (10') from a CO<sub>2</sub> tank or bib rack.
6. A sensor shall be required in a draft beer cooler connected to the CO<sub>2</sub> system
  - A sensor *MAY* also be required at the discretion of the AHJ at any point where the CO<sub>2</sub> system is vulnerable to mechanical damage which could cause a leak.
7. Sensors shall be installed in a manner preventing damage to the sensor.
8. If the sensor is installed in an enclosed space, a remote audible signaling device (80 dBa) shall be installed outside the enclosed space to indicate an alarm condition inside the enclosed space.
9. A visual indicating (amber strobe minimum 100 candela) device shall be installed where audible indicating devices are required. Visual signaling devices shall be installed in the best location providing earliest warning to occupants entering the space where a CO<sub>2</sub> system is installed.

## SIGNAGE INSTALLATION GUIDELINES

Approved warning signs shall be installed as follows:

1. A readily visible and durable sign shall be posted within four inches (4") below all amber strobes. The warning sign shall be at least 8 inches wide and 6 inches high and state the following on a contrasting background:

- Signs inside a room or area shall state:

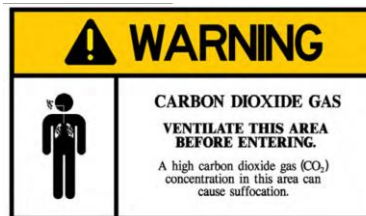
**FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED  
EVACUATE ROOM/AREA**

- Signs outside a room or at a remote location state:

**DO NOT ENTER WHEN LIGHT IS FLASHING  
CARBON DIOXIDE LEAK DETECTED**

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



3. Grow cultivation rooms/areas using or storing more than 100 pounds of CO<sub>2</sub> shall have the following signs posted on the exterior doors:



## TESTING AND MAINTENANCE

CO<sub>2</sub> systems and their safety systems shall be inspected and serviced annually by a professional to ensure correct operation.

- Testing and maintenance of emergency alarm gas detection system shall be, at a minimum, tested and maintained according to manufacturer's specifications if not otherwise specified hereinafter.
- The CO<sub>2</sub> system shall be checked for damage, wearing or missing components.
- The ventilation system (if applicable) shall be tested for correct operation.
- The emergency alarm system (if applicable) shall be tested for correct operation. Test shall include sensor detection of CO<sub>2</sub> gas as recommended by the manufacture.
- Gas detection monitoring sensors shall be calibrated annually.\*
- Gas detection monitoring sensors shall be replaced every ten (10) years.
- **The system shall be tagged indicating ALL systems were inspected and are in good working order.**
- **Records of work done shall be maintained on-site along with the device *User Manual* for review by the Code official and a copy the maintenance record shall be provided to the AHJ.**

\*After calibration sensors will be tested at 0.5% and 3.0% concentrations to show proper function. Sensors shall be tested as recommended by the manufacturer.

**A CO<sub>2</sub> system found not to be in good working order shall be shut down and taken out-of-service immediately until appropriate corrections are made by professional personnel.**

<sup>1</sup> ABC sensors constantly update background/baseline CO<sub>2</sub> levels by calculating periodic averages, using an algorithm, assuming the averages are safe. If a space is constantly occupied and/or there are not periods where outside levels drop to background levels then the ABC algorithm will not work. This is also the case for greenhouse or other agricultural applications where CO<sub>2</sub> levels may be elevated at all times.

References:

2015 International Fire Code  
NFPA 55, Chapter 13  
The National Board of Boiler and Pressure Vessel Inspectors  
CO<sub>2</sub> Meters, Inc.  
Ken's Beverage, Inc.  
AirTest Technologies, Inc.  
Bellevue Fire Department

**SAVINGS CLAUSE: Nothing outlined in this document shall be less than the minimum recommendations set forth by the device manufacturer. The intent is to provide specific guidance for installation and testing where not outlined by the manufacturer or to fortify the manufacture's recommendations.**