

COLORADO SPRINGS FIRE DEPARTMENT

Carbon Dioxide and Inert Gas Systems

Requirements for carbon dioxide and other inert gas systems.



TECHNICAL SERVICES
1/23/2020



Division of the Fire Marshal | 375 Printers Parkway | TEL 719-385-5978 • FAX 719-385-7334



Scope

This document outlines the Colorado Springs Fire Department's policies, procedures, requirements and local fire code interpretations pertaining to the permitting and installation of carbon dioxide and inert gas systems. It is not the intent of this document to reiterate fire code requirements. Fire code requirements can be viewed by visiting www.iccsafe.org. Local amendments to the fire code can be found at www.coloradosprings.gov and searching for "Fire Code Amendments" in the search field.

Purpose

Due to asphyxiation risks associated with carbon dioxide and inert gases stored on site for beverage dispensing, CSFD requires any CO2 and/or inert gas system with capacity greater than 100 pounds to be provided with ventilation and protected by a detection and alarm system. This system shall be designed to protect the storage area in addition to the points of use of the system throughout the facility, and shall alert the occupants of a hazardous condition within the space.

Definitions

CARBON DIOXIDE AND INERT GAS SYSTEM A system that utilizes a supply of carbon dioxide or inert gas for the purposes of beverage carbonation, atmospheric enrichment, or other purposes.

LOCAL ALARM An alarm, generally designed for awareness alerts and built into the detectors and/or CO2 control panel, that is located in the vicinity of a point of detection to alert those in the immediate area of an elevated gas level. There is usually a local alarm at the gas supply location and at each point of use.

POINT OF USE The location at which the gas supply lines connect to equipment for direct use, mixing, or dilution, where a leak could cause a large amount of gas to escape into the space. This is generally the place where a 100% gas concentration supply lines meets equipment for direct use, or where the gas is mixed such that any downstream distribution will be at concentrations too low to be hazardous, such as a Bag-in-Box (BiB) system for beverage dispensing.

Permitting, Plans, Fees, and Inspections of Carbon Dioxide and Inert Gas Systems

Permitting

A construction permit is required to be issued prior to installation of a carbon dioxide or inert gas system with a capacity greater than 100 pounds; systems with a capacity of 100 pounds or less do not require a permit. An annual, operational permit is required to be issued for use of the system after installation.

How to Complete the Permit Application

Once it is determined that a permit is required, a permit application must be completed. Visit <https://coloradosprings.gov/fire-department> and search for "Permit Application" to find the permit application. Complete the permit application accurately as follows:

- Under Part 1, fill in Sections 1, 2, and 3 with required information.
 - If the information is the same across sections, fill in Section 1 and state "Same as Above" under Company Name in Sections 2 and 3.
- Fill in and Sign Section 8.
- Under Part 2 (page 2), check the following box:
 - "105.7.22-Carbon Dioxide and Inert Gas Systems" that is located under the Construction Permits section.

Attach and/or submit completed permit application along with required plans and documentation to the Division of the Fire Marshal

Plans and Required Documentation

Two full copies of the application and all attached documentation shall be delivered to the Division of the Fire Marshal; hard copies shall have two full copies of the entire application paperwork. Electronic copies may be accepted for an additional fee.

The following, as applicable, is required to be submitted for review and acceptance of a Carbon Dioxide and Inert Gas System permit:

1. Completed permit application
2. Detailed and dimensioned or to scale site plan showing the following:
 - a. Gas supply/tank locations
 - b. Points of use
 - c. Detector and Horn/Strobes locations

- d. Control Panel Location
 - e. Automatic shutoff location
 - f. Gas supply line runs
 - g. Ventilation calculations
3. Cutsheet/product specification of tanks, detectors, control panel, valves, tubing, and any other devices provided.
 4. Description of alarm thresholds and sequences.

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 Division 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 or additional fees may be paid to expedite the plan review. The applicant will be notified either by phone and/or email the status of the application once the review has been completed.

Fees

Plan review and inspection fees are required for carbon dioxide and inert gas system permits. Fee amounts are based on the currently approved Division of the Fire Marshal fee schedule.

- The initial plan review fee covers the first two plan reviews and first inspection
- Third and subsequent plan review fees will be imposed in addition to the initial permit fee
- Second and subsequent inspection fees and/or trip fees will be imposed in addition to the initial permit fee should the structure not be ready for or fail inspection the first time
- Overtime fees will be imposed in addition to the initial fee should the inspection be requested after normal business hours
- Trip or inspection fees will be imposed in addition to the initial fee for inspection of additional arrangements

If desired, an expedited plan review fee may be paid to expedite review of the plans and permit application. This fee is in addition to the initial plan review fee.

Plan review fees must be paid before the inspection can be scheduled. Any fees resulting from multiple inspections will be billed to the applicant. If fees are not paid, future permit applications and/or inspections may be denied.

Once the plans have been reviewed and accepted, and the plan review fees have been paid, the contractor/installer may begin installation of the system in compliance with the accepted plans. Should the system be installed or in the process of being installed prior to approval of the application and fee payment, or if the system is installed not in accordance with the plans, a "Work without Permit" fee will be imposed in addition to the initial plan review fee.

Fees may be paid in person or via the phone. Cash, checks (made out to City of Colorado Springs), and credit cards (Visa and MasterCard only) are acceptable forms of payment.

To see the approved fee schedule, visit <https://coloradosprings.gov/fire-department> and search for "Fee Schedule" then select the "Fire Code Services Fee Schedule."

Inspections

A fire inspection of the system installation is required. To schedule an inspection, call 719-385-5978 and follow the prompts for inspection scheduling. It is recommended that the inspection be schedule at the same time that the fees are being paid. Due to the fluctuation of inspectors schedules, it is strongly recommend that inspections be scheduled a minimum of three business days prior to the date of the scheduled event.

The following is required for the fire inspection:

- Representative from the installing company be present
- Representative from the user be present
- System to be fully installed in accordance with the plan review and comments
- Any other items called out in the plan review

Once the system passes inspection, a permit will be issued and the system may be utilized.

Carbon Dioxide and Inert Gas System Requirements

It is the structure installer's responsibility to install the structure per all applicable requirements of the locally adopted fire code.

General

CO2 and Inert gas cylinders shall comply with chapter 53 of the 2015 IFC as amended for handling, use, and storage of cylinders and systems. Cylinder shall be designed and constructed for the appropriate gas, and shall be marked for the type of gas as required by the IFC. Gas piping shall be marked along its run in accordance with ASME A13.1 requirements.

Cylinders, containers, and tanks shall be secured against unauthorized access, dislodgement, and tipping over. This is accomplished

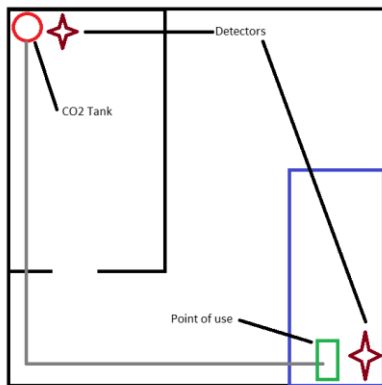
with approved fixed restraints, carts, nesting, or racking. Tanks shall be vented to the outside.

Detector Locations

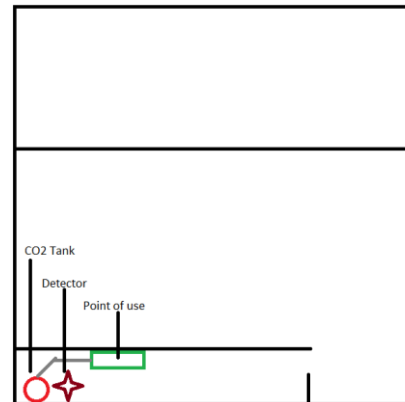
Carbon dioxide and inert gas systems with a capacity of 100 pounds or greater are required to comply with 2015 IFC Section 5307 as amended. Gas detection and monitoring is required to be installed at the source of the gas, if indoors, in addition to all indoor points of use, if remote from the source.

A common example of a point of use is the bag-in-box racks (BiB) for carbonated beverage dispensing; the gas supply is piped directly to the rack which is then mixed with the syrups and distributed to the soda dispensers. The point of use is at the BiB racks instead of the individual dispensers as though the input side of the rack has a pure CO₂ line supplying it, the CO₂ is low in concentration at the output of the BiB racks after being mixed and sent to the dispensers. Generally, where any pure gas supply lines terminate is considered the point of use.

If a point of use is remote from the supply, a gas detector is required at both the source and point of use; however, if the point of use and supply are close enough together that they can be monitored by a single detector based on the manufacturer's specifications, only one detector is required. See the following diagrams:



Situation 1: Separate use and Supply Locations



Situation 2: Use and Supply in Same Location

Ventilation Requirements

In addition to the detection requirements at the gas source and the supply, ventilation is also required to be provided in these same areas. This ventilation shall be provided at a rate of 1 cubic foot per minute (CFM) per square foot (sqft) of floor area in which the supply or points of use are located. This ventilation shall be exhausted to the exterior and shall not be recirculated. It can either be continuous or can turn on with activation of the detector alarms.

Ventilation Alternative - Automatic Shutoff Valve

If ventilation would be difficult to design or install into the space, an automatic shutoff valve for the gas can be provided in lieu of meeting the ventilation requirements. This valve shall be immediately downstream of the tanks' main shutoff valve. It shall be connected to the detection and alarm system, and shall actuate upon a gas detection alarm and/or loss of power to the system. This valve shall be rated for service for the respective gas, and for all expected pressures and temperatures.

Gas Detection System Sequences

General

The gas detection system shall be installed in accordance with 2015 IFC Section 5307 and per manufacturer instructions. The detectors are required to be placed at heights specified in Section 5307 to ensure timely detection (low for CO₂; mid for Nitrogen; high for Helium). The detector shall send a signal to horn strobes that are located at the point of detection and/or throughout the building, based on the configuration of the system as well as the type of gas.

Carbon Dioxide Detection Sequence

When the CO₂ detection system detects a concentration of 5,000ppm or greater, the system shall sound a local alarm; this alarm is only required to be sounded in the local area of detection (see definition of local alarm in this document). However, if the

concentration reaches 30,000ppm of CO₂, the system shall notify all occupants in the occupancy of a mandatory evacuation. Neither of these alarms is required to be latching (once the concentration reduces below 5,000ppm or 30,000, the respective alarm silences).

If the system is equipped with an automatic shutoff valve, the system is only required to have local alarms at 5,000ppm; the 30,000ppm occupancy-wide alarm and sequence is not required. Once the system detects 5,000ppm, the local alarm shall activate; in addition, the automatic shutoff shall actuate and remain closed until the concentration returns below 5,000ppm. No mandatory building evacuation alarm is required for a system with an automatic shutoff valve.

All Other Inert Gas Systems

All other inert gas systems shall have a detection system that shall monitor the oxygen concentration in the space, and shall alarm when the oxygen concentration decreases below 19.5%. This alarm is not required to be latching, but it shall notify the entire occupancy of a mandatory evacuation. If the system is equipped with an automatic shutoff valve, it shall actuate and remain closed when the oxygen concentration decreases below 19.5%, and remain closed until the concentration increases back above 19.5%. Only a local alarm is required for a system with an automatic shutoff valve; no occupancy-wide alarm is required.

Piping

Gas supply piping shall be suitable for the intended service gas, pressures, and temperatures, and be designed with a burst pressure four times the system design pressure. They shall be supported and protected to prevent undue strains and stresses, and labeled in accordance with ASME A13.1.

If the piping is run through areas are not monitored with an appropriate gas detector, clamp, bite, or other similar types of mechanical fittings are not to be used for couplings or other joints. These mechanical fittings are allowed if they are monitored by the detection system.

Signage

Appropriate warning signs shall be provided at the entrance to each building, room, enclosure, or closet in which the gas system is located. Please see 2015 IFC 5307.12 for exact signage details.

If there are any questions about these requirements, or if an alternate design may be desired, please contact the Division of the Fire Marshal at 719-385-7356.