

CITY OF HENDERSON FIRE SAFETY GUIDELINE

Effective Date: February 4, 2019

HFS# 018

Supersedes: All Others

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TITLE: Liquefied Carbon Dioxide (CO₂)

PURPOSE:

In accordance with the provisions of the 2018 International Fire Code, as adopted by the City of Henderson, section 5307.3 Liquefied Carbon Dioxide systems shall be installed in accordance with the 2018 IFC.

REFERENCE: 2018 IFC & 2016 NFPA 55 as amended.

RULES & REGULATIONS

1. 2018 IFC – 5307.3 Liquefied Carbon Dioxide.

1. Construction and operational permits shall be obtained for liquefied carbon dioxide containers or systems where the system capacity exceeds 100lbs as indicated in table 105.6.8 as amended.
2. 5307.3 Insulated liquid carbon dioxide systems used in beverage dispensing applications. Insulated liquid carbon dioxide systems with more than 100 pounds (45.4 kg) of carbon dioxide used in beverage dispensing applications shall comply with Section 5307.3.1.

5307.3.1 Ventilation. Where insulated liquid carbon dioxide storage tanks, cylinders, piping and equipment are located indoors, rooms or areas containing storage tanks, cylinders, piping and equipment, and other areas where a leak of carbon dioxide is expected to accumulate, shall be provided with mechanical ventilation in accordance with Section 5004.3 and designed to maintain the room containing carbon dioxide at a negative pressure in relation to the surrounding area.

Exception: A gas detection system complying with Section 5307.3.2 shall be permitted in lieu of mechanical ventilation.

5307.3.2 Gas detection system. Where ventilation is not provided in accordance with Section 5307.3.1, a gas detection system shall be provided in rooms or indoor areas and in below-grade outdoor locations with insulated carbon dioxide systems. Carbon dioxide sensors shall be provided within 12 inches (305 mm) of the floor in the area where the gas is expected to accumulate or other approved locations. The system shall be designed as follows:

1. Activates an audible and visible supervisory alarm at a normally attended location upon detection of a carbon dioxide concentration of 5,000 ppm (9000 mg/m³).
2. Activates an audible and visible alarm within the room or immediate area where the system is installed and stops the flow of carbon dioxide into the piping system upon detection of a carbon dioxide concentration of 30,000 ppm (54 000 mg/m³).
3. Approved sensors shall be connected to local visible and audible alarms which will alert building occupants at the space containing the liquefied carbon dioxide tank, cylinder, or container when the carbon dioxide level within the room reaches 3% v/v.

The audible devices and monitoring systems do not need to be tied into the fire alarm or sprinkler monitoring system. (1) Device shall be placed within the room housing the (CO₂) tank and (1) device shall be located at each entrance to the room warning those that enter of the hazard within. Devices are required to be distinctive in sound and color from fire alarm warning appliances. (We recommend the use of a yellow or amber strobe and constant tone horns.) Audible and visible notification devices shall have the ability to be perceived above the levels of ambient levels per OSHA 1910.

4. Even though the piping for the distribution of the CO₂ may be installed by a different provider than the monitoring equipment provider our inspectors will be verifying the routing and support of, to determine if additional sensors will be required to be installed.

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

2016 NFPA 55 - 13.6.3 – A warning sign shall be posted at the entrance to the building, room, enclosure, or confined area where the container is located

2016 NFPA 55 – 13.6.3.1 – The warning sign shall be at least 8” wide and 6” high and state the following:

CAUTION – CARBON DIOXIDE GAS

Ventilate the area before entering. A high carbon dioxide (CO₂) gas concentration in this area can cause suffocation.

IFC 2018 - 5003.5 Hazard identification signs. Unless otherwise exempted by the fire code official, visible hazard identification signs as specified in NFPA 704 for the specific material contained shall be placed on stationary containers and above-ground tanks and at entrances to locations where hazardous materials are stored, dispensed, used or handled in quantities requiring a permit and at specific entrances and locations designated by the fire code official.

5003.5.1 Markings. Individual containers, cartons or packages shall be conspicuously marked or labeled in an approved manner. Rooms or cabinets containing compressed gases shall be conspicuously labeled: COMPRESSED GAS.

5003.6 Signs. Signs and markings required by Sections 5003.5 and 5003.5.1 shall not be obscured or removed, shall be in English as a primary language or in symbols allowed by this code, shall be durable, and the size, color and lettering shall be approved.

2. Data submitted for approval. At least two copies of the following data shall be submitted to the fire code official with reference to the deviation from the recognized standard with the application for approval.
 1. Type and use of container, equipment or device.
 2. Material to be stored, used or transported.
 3. Description showing dimensions and materials used in construction.
 4. Design pressure, maximum operating pressure and test pressure.
 5. Type, size and setting of pressure relief devices.
 6. Other data requested by the fire code official.
 - (1) Location of CO₂ container including CO₂ container size, weight, state of contents (liquid or gas) and quantity. Location of vaporizer if used.
 - (2) Symbol legend with equipment description (manufacture's name and model number) and mounting description (surface, semi-flush, flush, and exterior).
 - (3) Site plan.
 - (4) Floor plan drawn to an indicated scale (1/8" minimum) on sheets of a uniform size showing, or as required by the fire code official:
 - a. Point of compass (north arrow).
 - b. Walls, doors, windows, openings, stairs, elevators, passageways, high-piled storage racks, etc., as applicable to depict the facility.
 - c. Room use identification labels (i.e., kitchen, dining room, storage room, etc.)
 - d. Gas piping distribution systems, manifolds, sizes and material types. Piping hangers and slopes.
 - e. Valves and valve boxes, outlets, gages and other components.
 - f. Location (mounting height etc.) of CO₂ sensors.
 - g. Electrical warning systems (local alarm audible/visual appliance), conductor/conduit routing and size, power panel and circuit connection.
 - h. Location of warning signs. Details for warning signs such as text, size, color and attachment method.
 - i. Product data submittal including a cover index sheet itemizing the products used by make and model number and manufacturer data sheets (highlighted or marked) information for equipment, devices, and materials used.
 - j. Design number and detail of penetration fire stop system when required.

- k. Demonstration of compliance via notes, plans, and details with the applicable items listed in this guideline or Code sections.

- 3. 2016 NFPA 55 – 13.3.1.2 – Pressure Relief Devices. Containers used for liquid carbon dioxide shall be equipped with pressure relief devices piped from the uppermost part of the containers and communicating with the vapor space.

2016 NFPA 55 – 13.3.1.2.2 – 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 or the pressure relief device. The termination point of pressure relief vent discharge piping shall be outdoors and a minimum of 10 feet from operable openings into the building.

2016 NFPA 55 – 13.3.2.1 – Containers, cylinders, and tanks shall be provided with a pressure gauge and level gauge or device for indicating the quantity of liquid carbon dioxide.

2016 NFPA 55 – 13.3.2.3 – 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.

2016 NFPA 55 – 13.3.3.1 – Carbon dioxide piping shall be located and supported to protect against damage from strain on piping and fittings; the effects of expansion, contraction, and vibration; mechanical damage; and heat sources.

2016 NFPA 55 – 13.3.3.2 – Piping, tubing, and hoses and fittings shall be designed to a bursting pressure of at least four times the system design pressure.

2016 NFPA 55 – 13.4 – Materials of construction shall be employed for potential exposure to a temperature of -109.3 F.