

CITY OF HENDERSON FIRE SAFETY GUIDELINE

Effective Date: July 1, 2014

HFS# 018

Supersedes: All Others

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TITLE: Liquefied Carbon Dioxide (CO₂)

PURPOSE:

In accordance with the provisions of the 2012 International Fire Code, as adopted by the City of Henderson, Section 5307.3 Liquefied Carbon Dioxide systems (Amended Section 5301.1) shall be installed in accordance with the 2012 IFC.

REFERENCE: 2012 IFC & 2010 NFPA 55 as amended.

RULES & REGULATIONS

1. 2012 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. Rooms containing liquefied carbon dioxide tanks, cylinders or containers must be equipped with approved sensors capable of detecting carbon dioxide concentrations of 3% v/v (30,000 parts per million(OSHA STEL)).

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 an amber strobe and constant tone horns.

4. Rooms required to be 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.

2010 NFPA 55 - 13.2.3 – A warning sign shall be posted at the entrance to the building, room, enclosure, or confined area where the container is located

2010 NFPA 55 – 13.2.3.1 – 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.

2. 2012 IFC - 5503.1.1.1 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 (manufacturer'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 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. 2012 IFC 5503.3.1 Sizing - Pressure relief device vent piping shall have a cross-sectional area not less than that of the pressure relief device vent opening and shall be arranged so as not to restrict the flow of escaping gas.

2012 IFC 5503.4 Marking - Cryogenic containers and systems shall be marked in accordance with Sections 5503.4.1 through 5503.4.6.

2012 IFC 5503.4.1 Identification signs - Visible hazard identification signs in accordance with NFPA 704 shall be provided at entrances to buildings or areas in which cryogenic fluids are stored, handled or used.

2012 IFC 5503.4.2 Identification of contents - Stationary and portable containers shall be marked with the name of the gas contained. Stationary above-ground containers shall be placarded in accordance with Sections 5003.5 and 5003.6. Portable containers shall be identified in accordance with CGA C-7.

2012 IFC 5503.4.3 Identification of containers - Stationary containers shall be identified with the manufacturing specification and maximum allowable working pressure with a permanent nameplate. The nameplate shall be installed on the container in an accessible location. The nameplate shall be marked in accordance with the ASME Boiler and Pressure Vessel Code or DOTn 49 CFR Parts 100-185.

2012 IFC 5503.4.4 Identification of container connections - Container inlet and outlet connections, liquid-level limit controls, valves and pressure gauges shall be identified in accordance with one of the following: marked with a permanent tag or label identifying their function, or identified by a schematic drawing which portrays their function and designates whether they are connected to the vapor or liquid space of the container. Where a schematic drawing is provided, it shall be attached to the container and maintained in a legible condition.

2012 IFC 5503.4.5 Identification of piping systems - Piping systems shall be identified in accordance with ASME A13.1.

2012 IFC 5503.4.6 Identification of emergency shutoff valves - Emergency shutoff valves shall be identified and the location shall be clearly visible and indicated by means of a sign.

2012 IFC 5503.5.2 Securing of containers - Stationary containers shall be secured to foundations in accordance with the International Building Code. Portable containers subject to shifting or upset shall be secured. Nesting shall be an acceptable means of securing containers.

2012 IFC 5503.5.3 Securing of vaporizers - Vaporizers, heat exchangers and similar equipment shall be anchored to a suitable foundation and its connecting piping shall be sufficiently flexible to provide for the effects of expansion and contraction due to temperature changes.

2012 IFC 5503.5.4 Physical protection - Containers, piping, valves, pressure relief devices, regulating equipment and other appurtenances shall be protected against physical damage and tampering.

2012 IFC 5503.10 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.

2012 IFC 5504.2.1 Stationary containers - Stationary containers shall be installed in accordance with the provisions applicable to the type of fluid stored and this section.

2012 IFC 5504.2.1.1 Containers - Stationary containers shall comply with Section 5503.1.

2012 IFC 5504.2.1.2 Construction of indoor areas - Cryogenic fluids in stationary containers stored indoors shall be located in buildings, rooms or areas constructed in accordance with the International Building Code.

2012 IFC 5504.2.1.3 Ventilation - Storage areas for stationary containers shall be ventilated in accordance with the Uniform Mechanical Code.

2012 IFC 5504.2.2 Portable containers - Indoor storage of portable containers shall comply with the provisions applicable to the type of fluid stored and Sections 5504.2.2.1 through 5504.2.2.3.

2012 IFC 5504.2.2.1 Containers - Portable containers shall comply with Section 5503.1.

2012 IFC 5504.2.2.2 Construction of indoor areas - Cryogenic fluids in portable containers stored indoors shall be stored in buildings, rooms or areas constructed in accordance with the International Building Code.

2012 IFC 5504.2.2.3 Ventilation - Storage areas shall be ventilated in accordance with the Uniform Mechanical Code.

2012 IFC 5505.1.2.3 Valves and accessory equipment - Valves and accessory equipment shall be suitable for the intended use at the temperatures of the application and shall be designed and constructed to withstand the maximum pressure at the minimum temperature to which they will be subjected.

2012 IFC 5505.1.2.3.1 Shutoff valves on containers - Shutoff valves shall be provided on all container connections except for pressure relief devices. Shutoff valves shall be provided with access thereto and located as close as practical to the container.

2012 IFC 5505.1.2.4 Physical protection and support - Piping systems shall be supported and protected from physical damage. Piping passing through walls shall be protected from mechanical damage.

4. 2010 NFPA 55 – 13.1.1 – 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.

2010 NFPA 55 – 13.1.1.2.2 – 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.

2010 NFPA 55 – 13.1.2.1 – Containers, cylinders, and tanks shall be provided with a pressure gauge and level gauge or device for indicating the quantity of liquid carbon dioxide.

2010 NFPA 55 – 13.1.2.3 – 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.

2010 NFPA 55 – 13.1.3.1 – 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.

2010 NFPA 55 – 13.1.3.2 – Piping, tubing, and hoses and fittings shall be designed to a bursting pressure of at least four times the system design pressure.

2010 NFPA 55 – 13.1.4 – Materials of construction shall be employed for potential exposure to a temperature of -109.3 F.
