

A Code Review for the Use and Storage of Compressed Carbon Dioxide

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I. INTRODUCTION

This document was prepared to list the requirements for the use and storage of compressed carbon dioxide. These requirements are based on the 2009 edition of the *International Fire Code (IFC)* and the 2005 edition of NFPA-55. Please note that in addition to the code requirements below that carbon dioxide poses a serious asphyxiation hazard compared to other gases. A concentration of just 10% (100,000 ppm) can lead to unconsciousness or death. If more information is desired on this subject, please visit the following site: http://www.osha.gov/dts/hib/hib_data/hib19960605.html.

II. CODE REVIEW FOR THE STORAGE AND USE OF COMPRESSED CARBON DIOXIDE

A. Location Security

1. Section 7.1.4.1 of NFPA-55 states that compressed gas containers, cylinders, tanks, and systems are to be secured against accidental dislodgement and against access by unauthorized personnel.
2. Section 7.1.4.2 of NFPA-55 and Section 3003.5.1 of the IFC state that areas used for the storage, use, and handling of compressed gas containers, cylinders, tanks, and systems are to be secured against unauthorized entry and safeguarded in an approved manner.

B. Tank Protection and Security

1. Section 7.1.4.3.1 of NFPA-55 and Section 3003.5.2 of the IFC state that compressed gas containers, cylinders, tanks, and systems that could be exposed to physical damage are to be protected.
2. Section 7.1.4.4 of NFPA-55 and Section 3003.5.3 of the IFC state that compressed gas containers, cylinders, and tanks are to be secured to prevent falling caused by contact, vibration, or seismic activity. Securing of compressed gas containers, cylinders, and tanks is to be by one of the following methods:
 - a. Securing containers, cylinders, and tanks to a fixed object with one or more restraints.
 - b. Securing containers, cylinders, and tanks on a cart or other mobile device designed for the movement of compressed gas containers, cylinders, or tanks.

Exception: Compressed gas containers, cylinders, and tanks in the process of examination, filling, transport, or servicing are not required to be secured.

3. Section 7.1.5.2 of NFPA-55 states that where compressed gas containers, cylinders, and tanks are designed to accept valve protective caps, the user is to keep such caps on the compressed gas containers, cylinders, and tanks at all times, except when empty, being processed, or connected for use.
4. Section 7.1.6.6 of NFPA-55 and Section 3003.7.5 of the IFC state that compressed gas containers, cylinders, and tanks are not to be placed in areas where they are capable of being damaged by falling objects.
5. Section 7.1.6.4 of NFPA-55 and Section 3003.7.3 of the IFC state that compressed gas containers, cylinders, and tanks are not to be placed near elevators, unprotected platform ledges, or other areas where falling would result in compressed gas containers, cylinders, or tanks being allowed to drop distances exceeding one-half the height of the container, cylinder, or tank.

C. Sign Requirements

1. Section 4.9.2.3 of NFPA-55 states that rooms or cabinets containing compressed gases are to be conspicuously labeled as follows: COMPRESSED GAS.

D. Ventilation Requirements

1. Section 6.16 of NFPA-55 states that indoor storage and use areas and storage buildings for compressed gases and cryogenic fluids are to be provided with mechanical exhaust ventilation or natural ventilation, where natural ventilation can be shown to be acceptable for the material as stored.

Exception: Section 6.16.2 of NFPA-55 states that ventilation is not required for cylinders containing compressed air.

2. Section 6.16.1 of NFPA-55 states that where mechanical ventilation is provided, the system is to be operational during the time the building or space is occupied.
3. Section 6.16.3 of NFPA-55 states that mechanical ventilation is to be at a rate of not less than $1 \text{ ft}^3/\text{min}/\text{ft}^2$ of floor area over the area of storage or use.
4. Section 6.16.5 of NFPA-55 states that where powered ventilation is provided, a manual shutoff switch is to be provided outside of the room in a position adjacent to the principle access door to the room or in an approved location.
5. Section 6.16.6 of NFPA-55 states that the switch is to be the break-glass or equivalent type and is to be labeled as follows: "VENTILATION SYSTEM EMERGENCY SHUT-OFF."
6. Section 6.16.7.2 of NFPA-55 states that for gases that are heavier than air, exhaust is to be taken from a point within 12 in. of the floor.
7. Section 6.16.7.3 of NFPA-55 states that for gases that are lighter than air, exhaust is to be taken from a point within 12 in. of the ceiling.

8. Section 6.16.8 of NFPA-55 states that the location of both the exhaust and inlet air openings are to be designed to provide air movement across all portions of the floor or room to prevent the accumulation of vapors.
9. Section 6.16.10 of NFPA-55 states that ventilation discharge is to be a minimum of 50 ft from air intakes.

E. Maintenance of Egress

1. Section 1030.2 and 1030.3 of the IFC states that a means of egress is to be continuously maintained free from obstructions or impediments to full instant use in case of fire or other emergency.

F. Cylinder Separation from Hazards

1. Section 7.1.6.8 of NFPA-55 and Section 3003.7.7 of the IFC state that open flames and high-temperature devices are not to be used in a manner that creates a hazardous condition.
2. Section 7.1.6.1.1 of NFPA-55 and Section 3003.7 of the IFC state that compressed gas containers, cylinders, tanks, and systems in storage or use are to be separated from materials and conditions which present exposure hazards to or from each other.
3. Section 7.1.6.3 of NFPA-55 and Section 3003.7.2 of the IFC state that combustible waste, vegetation, and similar materials are to be kept a minimum of 10 feet from compressed gas containers, cylinders, tanks, and systems. A noncombustible partition without openings or penetrations and extending not less than 18 inches above and to the sides of the storage area is allowed in lieu of such distance. The wall is to be an independent structure, or the exterior wall of the wall of the building adjacent to the storage area. The wall is to be a minimum of 5 ft. tall.
4. Section 7.1.6.9 of NFPA-55 and Section 3003.7.8 of the IFC state that compressed gas containers, cylinders, tanks, and systems are not to be exposed to corrosive chemicals or fumes which could damage containers, cylinders, tanks, valves, or valve-protective caps.
5. Section 3004.1 of the IFC states that compressed gas containers and cylinders with a capacity greater than 5 L, except those designed for use in a horizontal position, are to be stored in an upright position with the valve end up.