Department of Community Affairs

Division of Fire Safety | Fire Code Enforcement

BULLETIN: 2015-1

SUBJECT: Liquid Carbon Dioxide (CO_2) Carbonated Beverage Systems

REFERENCE: N.J.A.C. 5:70-2.7(a)6.i., N.J.A.C. 5:70-3, Sections 2703.5, 2704.3, 3007.1 and 3007.2 (IFC/2006), N.J.A.C. 5:23-3.14, Sections 307.2 and 414.1.2 (IBC/2009) and Sections 2703.5, 2704.3, 3007.1 and 3007.2. (IFC/2009)

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This Bulletin is being issued by the Divisions of Fire Safety and Codes and Standards to provide information on how to address installations of CO_2 carbonated beverage systems.

History

The Divisions of Fire Safety and Codes and Standards have reviewed incidents involving injuries and deaths caused by CO_2 poisoning as a result of leaking carbonated beverage systems. While we are not aware of any deaths in New Jersey, we are aware of incidents that have occurred. Gaseous CO_2 is 1.5 times heavier than air; leaking CO_2 can accumulate at floor level in improperly ventilated or unventilated rooms not necessarily limited to the storage tank location or in low areas, such as basements.

CO_2 makes up approximately 0.04% of the atmospheric air that we breathe and should not be confused with the toxic gas Carbon Monoxide (CO). At normal levels, CO_2 is non-toxic and is safe to be added to beverages to carbonate them. It is possible, however, to suffer anoxia or asphyxiation from breathing higher levels of CO_2. Elevated blood and tissue levels of CO_2 are termed hypercapnia and hypercarbia.

These systems have evolved from DOT regulated cylinders ranging in capacity from ten to 100 lbs. of liquid to pressure vessels ranging from 200 to 750 lbs. of liquid. One pound of liquid CO_2 equals 8.74 cubic feet of gas and one gallon of liquid equals 74 cubic feet. The size of the pressure vessel is based on both the volume of beverages served at the location and the delivery frequency of the distributor/supplier. It is the use of systems relying on significantly higher amounts of CO_2 that has caused the two divisions to issue this bulletin.

UFC

N.J.A.C. 5:70-2.7(a)6.i. requires a Type IV permit be obtained when more than 6,000 cubic feet of non-flammable gas is being stored. When a system has a capacity of more than 686.5 lbs. or more than 81 gallons of carbon dioxide, a Type IV permit is required. (Note: The maximum amount that can be stored before a UFC permit would be required is 686.5 lbs. x 8.74 cubic feet = 6000 cubic feet or 81 gallons x 74 cubic feet = 5994 cubic feet.). All installations require the NFPA 704 designation be posted in accordance with Section 2703.5 of the IFC. The sign is required when the business requires a permit. Installation of the sign needs to be at the entrance door as approved by the fire official or the fire protection subcode official for new installations. The rear entrance door should be considered an approved location. The markings for this hazard are as follows: the blue health diamond must have the number three (3), the white special hazard diamond must have the letters SA to indicate a simple asphyxiant hazard is present and the remaining diamonds will have the number zero (0) displayed.

UCC

New installations of liquid CO_2 carbonated beverage systems require a construction permit. They are regulated by the Construction Official and require the installation of an exhaust ventilation system or a CO_2 detection system. As per the definition at Section 307.2 of the NJ International Building Code (IBC), a chemical or substance that has a health hazard is considered a "Hazardous Material." A "Health Hazard" is defined as a chemical that poses acute or chronic health effects to an exposed person. IBC Section 414.1.2, Materials, requires compliance with the International Mechanical Code and International Fire Code (IMC/IFC) for individual hazardous materials. IFC Section 3007 requires materials not otherwise regulated that are an asphyxiant, irritant or radioactive to comply with this section.

Specifically, IFC Section 3007.2 requires mechanical or natural ventilation in accordance with IFC Sections 2704.3 and 2705.1.9. IFC Section 2704.3 requires a mechanical exhaust ventilation system when it is shown that natural ventilation does not meet the requirements of IFC Section 2704.3.1. The ventilation system is currently required to run continuously per IFC Section 2704.3.1. An emergency shutoff control switch is also required adjacent to the storage room access door.

Note: In some cases, CO_2 systems are also being installed for swimming pools and possibly other applications. These installations must follow the requirements above for any amount of liquid CO_2.

Below is a list of the new requirements that were approved for addition into the 2015 IFC. There will be a new section that specifically deals with carbonated beverage CO_2 systems.

1. 100 lbs. or more of carbon dioxide used in beverage dispensing applications will be required to comply with the new regulations.

2. The storage, use, and handling of liquid carbon dioxide will be required to comply with the applicable requirements of NFPA 55, Chapter 13.

3. Carbon dioxide systems will need protection from damage by occupants or equipment during normal facility operations. This includes storage tanks, cylinders, piping and fittings.

4. Areas where a leak of CO_2 could collect will be required to be provided with either ventilation or an emergency alarm system consisting of CO_2 detectors and local alarm.

Mechanical ventilation will be required to comply with the *International Mechanical Code* and with all of the following:

1. Mechanical ventilation in the room or area will be at a rate of not less than one (1) cubic foot per minute per square foot.

2. Exhaust must be taken from a point within 12 inches of the floor.

3. The ventilation system must be designed to operate at a negative pressure in relation to the surrounding area.

An emergency alarm system will be required to comply with all of the following:

1. Continuous gas detection provided to monitor areas where carbon dioxide can accumulate.

2. The threshold for activation of a detector not to exceed 5,000 parts per million.

3. A local alarm device installed at an approved location.

UFC and UCC

System installations of more than 874 cubic feet or 100 lbs. will be the new threshold in the 2015 IFC. Fire Officials finding installations that have not been approved by the construction official must issue a violation notice per N.J.A.C. 5:70-3, 3007.2. and notify the construction official of their findings. Currently, the UFC as well as the 2009 IFC referenced by the UCC, require compliance with Section 2704.3.1 for any amount of CO_2. A business owner could comply with the new threshold of 100 lbs. and the other requirements of the 2015 IFC above instead of requiring the ventilation for all businesses that have less than 100 lbs. A CO_2 detection system that meets the requirements of the 2015 IFC discussed above may be installed as an alternative to installing the required ventilation system. When a business owner opts to install a local detection system, it may be approved by the fire subcode official. There are no additional permit requirements for less than 686.5 lbs. and 81 gallons, so an operational UFC permit is not required. It would be reasonable to accept an installation that is in accordance with the 2015 IFC regulations.

These pressure vessels are regulated by the New Jersey Department of Labor (NJ DOL), Boiler and Pressure Vessel Bureau (609-292-2921). An inspection sticker will be issued by the NJ DOL for the use of the pressure vessel. The Boiler and Pressure Vessel Bureau will perform a site inspection every three (3) years. UCC approval should not be issued for these installations until documentation of NJ DOL registration has been verified.

The Uniform Fire Code must be used to regulate the maintenance of these systems.