FIRE DEPARTMENT • CITY OF NEW YORK

STUDY MATERIAL FOR THE CERTIFICATE OF FITNESS EXAMINATION

G-82

INSTALLATION AND DISPENSING OF CARBON DIOXIDE (CO_2) BEVERAGE DISPENSING SYSTEMS (Citywide)

All applicants are required to apply and pay for an exam online before arriving at the FDNY. It can take about 30 minutes to complete.

Simplified instructions for online application and payment can be found here:

http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf

Create an Account and Log in to:

http://fires.fdnycloud.org/CitizenAccess

THIS TEST COVERS THE FOLLOWING:

INSTALLATION AND DISPENSING OF CARBON DIOXIDE (CO_2) BEVERAGE DISPENSING SYSTEMS (G-82)

NEW APPLICANTS who perform INSTALLS AND DISPENSE CARBON DIOXIDE (for low pressure soda carbonation)	**Take this G-82 COF exam**
CURRENT APPLICANTS who have G-97 COF AND WORK WITH DISPENSING OR INSTALLATIONS OF CO_2 FOR SODA CARBONATION	**Take this G-82 COF exam when current G-97 COF expires**
CURRENT APPLICANTS WHO HAVE A G-28 COF AND WORK WITH **DISPENSING** OF CO_2 FOR SODA CARBONATION	**Take this G-82 COF exam when your current G-28 COF expires**
CURRENT APPLICANTS WHO HAVE A G-28 COF AND SUPERVISE **STORAGE** & USE OF A BULK LIQUID CO2 TANK IN A BOTTLING PROCESS	**Take this G-46 COF exam when your current G-28 COF expires**
NEW APPLICANTS who REQUIRE A PERMIT FOR STORAGE AND USE OF CO_2	**Take the G-46 COF**
CURRENT APPLICANTS WHO HAVE: G-97 COF (NOT for CO_2); G-15; G-41; G-49; G-50; G-51	**Take the NEW G-79 COF exam when your current COF expires**

THIS TEST DOES NOT COVER THE FOLLOWING:

REFRIGERATING/AIR CONDITIONING SYSTEMS

Applicants who need a Certificate of Fitness for operating Refrigerating/Air Conditioning Systems must take the exam: **REFRIGERATING SYSTEM OPERATING ENGINEER (Q-99/Q-01)**

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EXAM SPECIFIC INFORMATION FOR G-82 CERTIFICATE OF FITNESS

Save time and submit application online!

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http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf

Create an Account and Log in to:

http://fires.fdnycloud.org/CitizenAccess

REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION

General requirements:
Review the General Notice of Exam:
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special requirements for the G-82 Certificate of Fitness:

- This COF was originally known as the G-28 COF exam and later as part of the G-97 COF exam, was superseded in May 2018 by the **G-82 Certificate of Fitness** for handling and dispensing of carbon dioxide. Upon expiration of old G-28 or the G-97, Certificate of Fitness holders will need to take the **NEW G-82** exam.
- The G-82 Certificate of Fitness for handling and dispensing of carbon dioxide was superseded in July 2018 by a **revised and updated G-82 exam for Storage, Handling Use of Carbon Dioxide.** The **G-46 Certificate of Fitness,** formerly issued for Storage and Use of Carbon Dioxide **has been consolidated and replaced by the revised G-82.**
- **Persons engaged in the storage, handling or use of carbon dioxide should apply for the revised G-82 Certificate of Fitness at time of expiration.** Applicants will have to certify that they have read Fire Department rule 3 RCNY 3004-01, but no additional examination will be required.

Application fee (Cash is NO LONGER ACCEPTED):
Pay the **$25** application fee online or in person by one of the following methods:

- Credit card (*American Express, Discover, MasterCard, or Visa*)

- Debit card (*MasterCard or Visa*)
- In person: Personal or company check or money order (*made payable to the New York City Fire Department)*

A convenience fee of 2% will be applied to all credit card payments.

For fee waivers submit: ***(Only government employees who will use their COF for their work- related responsibilities are eligible for fee waivers.)***

- A letter requesting fee waiver on the Agency's official letterhead stating applicant full name, exam type and address of premises; ***AND***
- Copy of identification card issued by the agency

REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE (AIP)

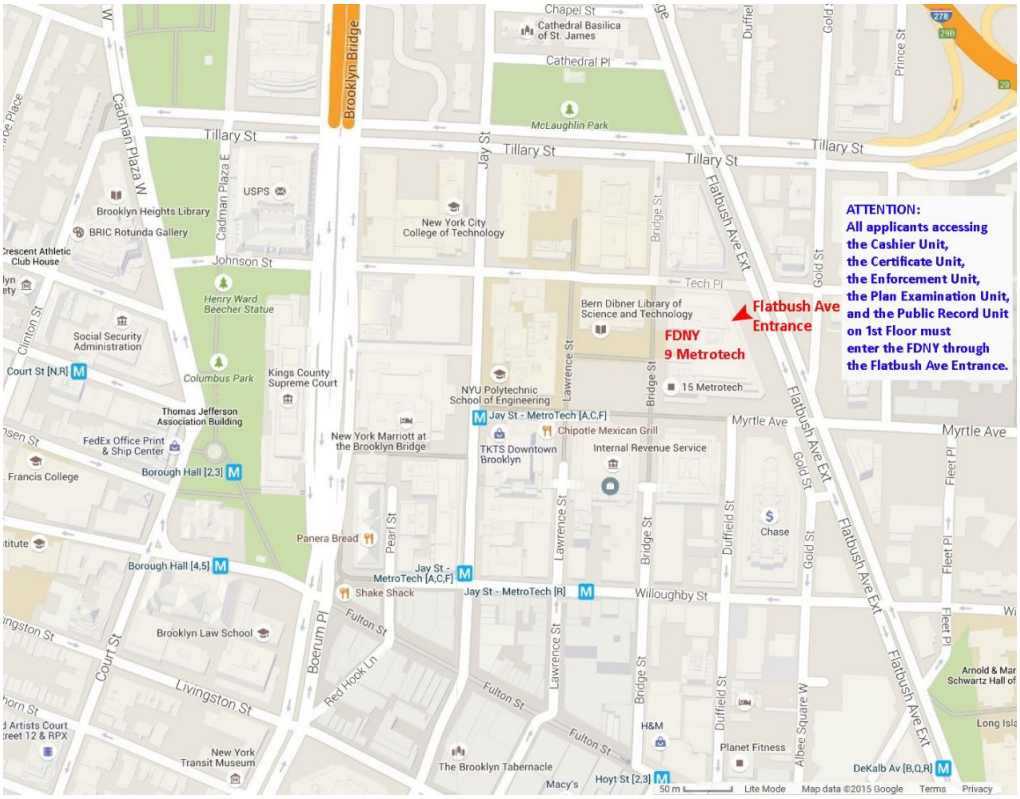
No AIP available. This certificate of fitness can only be obtained by passing the computer exam at the FDNY Headquarters.

EXAM INFORMATION

The G-82 test will consist of **25** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limit exam. Based on the amount of the questions, you will have 37 minutes to complete the test. A passing score of at least 70% is required in order to secure a Certificate of Fitness.

Please always check for the latest revised booklet at the FDNY website before you take the test, the Certificate of Fitness Study Material link, below http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-g82-noe-study-materials.pdf

Exam site: **FDNY Headquarters,** 9 MetroTech Center, Brooklyn, NY. Enter through the **Flatbush Avenue entrance (between Myrtle Avenue and Tech Place)**.



RENEWAL REQUIREMENTS

General renewal requirements:
Review the General Notice of Exam:
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special renewal requirements for G-82 COF: None

The FDNY strongly recommends the G-82 COF holders to renew the COF on-line. To learn the simplified on-line renewal:
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-simplified-renewal-short.pdf

QUESTIONS?

FDNY Business Support Team: For questions, call 311 and ask for the FDNY Customer Service Center or send an email to FDNY.BusinessSupport@fdny.nyc.gov

STUDY MATERIAL AND TEST DECRIPTION

About the Study Material

This study material will help you prepare for the examination for the G-82 Certificate of Fitness for the Installation and Dispensing of Carbon Dioxide (Co2) Beverage Dispensing Systems.

The study material includes information taken from the New York City Fire Code Chapters 27 and 30, New York City Fire Department Rule 3 RCNY 3004-01, International Fire Code Section 5307 (2015 edition) and National Fire Protection Association (NFPA) Standard No. 55 of Chapter 13 (2016 edition). The exam covers this entire study material booklet and any tables. **This material will not be provided to you during the test. It is critical that you read and understand this booklet to help increase your chance of passing this exam.**

The study material **does not** contain all of the information you need to know to dispense into carbon dioxide containers. It is your responsibility to become familiar with all applicable rules and regulations of the City of New York, even if they are not covered in this study material. In order to adequately prepare for the exam, you need to be familiar with the Fire Code Chapters 27, 30, Fire Department Rule 3 RCNY Section 3004-01 (which is consolidated in Chapter 30 of Title 3 of the Rules of the City of New York.)

About the Test

The G-82 Certificate of Fitness exam consists of **25** multiple-choice questions with four alternative answers to each question. Only one answer is correct for each question. If you do not answer a question, or if you choose more than one alternative answer, the question will be scored as incorrect. A score of 70% is required in order to qualify for the Certificate of Fitness. Read each question carefully before marking your answer. There is no penalty for guessing.

Sample Questions

1. Which of the following are allowed to be used/displayed while taking a Certificate of Fitness examination at 9 Metro Tech Center?

I. cellular phone
II. study material booklet
III. reference material provided by the FDNY
IV. mp3 player

A. III only
B. I, II, and III
C. II and IV
D. I only

Only reference material provided by the FDNY is allowed to be used during Certificate of Fitness examinations; therefore, the correct answer would be A. You would touch “A” on the computer terminal screen.

2. If you do not know the answer to a question while taking an examination, who should you ask for help?

A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. you should not ask about test questions since FDNY staff cannot assist applicants

You should not ask about examination questions or answers since FDNY staff cannot assist applicants with their tests. Therefore, the correct answer would be D. You would touch "D" on the computer terminal screen.

3. If the screen on your computer terminal freezes during your examination, who should you ask for help?

A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. the computer help desk

If you have a computer related question, you should ask the examiner in the testing room. Therefore, the correct answer would be C. You would touch “C” on the computer terminal screen.

1. INTRODUCTION

Carbon dioxide is used for refrigerating and fire extinguishing systems, but the most common use is for carbonation of soft drinks in restaurants and other places of business.

The G-82 Certificate of Fitness is intended for all persons involved in the storage, handling and use of carbon dioxide, specifically including persons responsible for installing carbon dioxide beverage dispensing storage systems, and the dispensing of carbon dioxide from a cargo tank truck into low pressure carbon dioxide storage container through an approved fill port.

Chapters 27 and 30 set forth general requirements for the storage, handling and use of hazardous materials and compressed gases generally. Fire Department rule 3 RCNY 3004-01 sets forth specific requirements for the storage, handling and use of low-pressure, liquefied carbon dioxide in beverage dispensing systems.

Specific regulations for the storage, handling and use of high-pressure carbon dioxide containers are under development, and are NOT included in this study material and will not be tested on the G-82 exam at this time.

1.1 WHAT IS CARBON DIOXIDE?

Carbon Dioxide is a combination of carbon and oxygen atoms in a 1:2 ratio expressed by the chemical symbol CO_2. Carbon Dioxide is a liquefied nonflammable gas.

Carbon dioxide is a colorless, odorless gas at normal atmospheric temperature and pressure, about 1.5 times denser than air. It can be cooled or compressed to a liquid or a solid (dry ice).

1.2 CERTIFICATE OF FITNESS REQUIREMENT AND RESPONSIBILITIES

Storage, handling and use of carbon dioxide above permit amounts must be under the supervision of a person holding a G-82 Certificate of Fitness.

The storage of carbon dioxide above permit amounts must be under the general supervision of a G-82 Certificate of Fitness holder. The G-82 Certificate of Fitness holders are responsible for ensuring that all Fire Department regulations related to the safe handling and dispensing of carbon dioxide on the premises are obeyed. Stationary carbon dioxide installations must be maintained in good working order.

The storage containers, piping and other components should be visually inspected not less than once every 3 months.

Specific regulations apply to carbon dioxide beverage dispensing systems storing more than 100 pounds of carbon dioxide. Such systems must be installed by a G-82 Certificate of Fitness holder, who is responsible for ensuring that such installations fully comply with the requirements of Fire Department rule 3 RCNY 3004-01.

At time of installation of a carbon dioxide beverage dispensing system, and at least once a year thereafter, the owner and/or other responsible persons at the premises shall be trained by G-82 certificate of fitness holder. The carbon dioxide safety information training shall be given verbally and in a written form.

The handling of carbon dioxide in quantities requiring a permit shall be under the **personal supervision** of a person holding a G-82 Certificate of Fitness.

The dispensing of carbon dioxide container from any source shall be performed by a person holding a G-82 Certificate of Fitness.

All filling of liquefied, low-pressure carbon dioxide beverage dispensing systems, from a cargo tank truck through an exterior fill port, must be conducted by a G-82 Certificate of Fitness holder.

1.3 BUSINESS OWNER RESPONSIBILITIES

Business owners are responsible for obtaining a Fire Department permit for the storage, handling and use of carbon dioxide at, or above permit amounts.

Business owners are responsible for ensuring that carbon dioxide is safely stored, handled and used on their premises. Business owners must employ or otherwise retain the services of a G-82 Certificate of Fitness holder to make sure that the carbon dioxide installation is being maintained in a safe condition and that all components are in good working order. G-82 Certificate of Fitness holders must perform the inspections, and other duties as required by the Fire Code and Fire Department rules, as explained in this study material.
Fire Department rule 3004-01 sets forth specific requirements for carbon dioxide beverage dispensing systems storing more than 100 pounds of carbon dioxide. If such systems are maintained by the installer/supplier of the system, the installer/supplier personnel will hold the G-82 Certificate of Fitness. The business owner must have and keep on the premises a copy of the G-82 Certificate of Fitness card of employed individual who is responsible for the maintenance of the business owners' carbon dioxide beverage dispensing system.

If the installer/supplier is not responsible for the maintenance of the beverage dispensing system, the business owner must employ or otherwise retain the services of a G-82 Certificate of Fitness holder to perform the inspections, training and other

duties necessary to make sure that the carbon dioxide installation is being maintained in a safe condition and that all components are in good working order.

As required by the Fire Department rule 3 RCNY 3004-01, after being notified by the business owner, the installer/supplier must notify the Fire Department in writing of any **new** carbon dioxide beverage dispensing system storing more than 400 pounds of carbon dioxide, and **any alterations** or **repairs** to such a system.

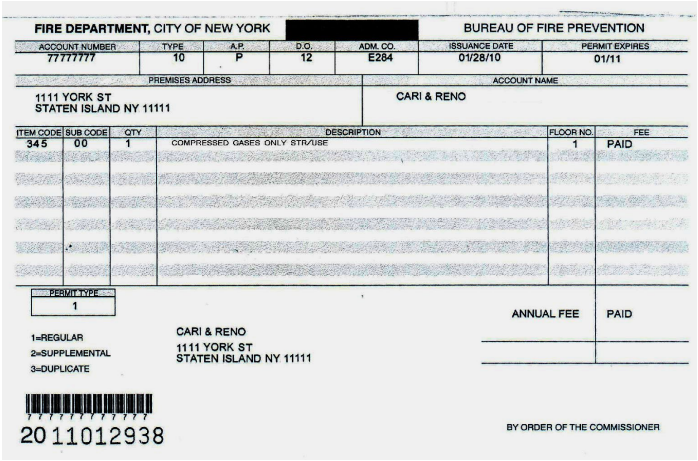
Also, the notification has to be made to the Fire Department by the installer/supplier upon inspection or repair of carbon dioxide beverage dispensing system after the activation of an emergency alarm or other release of carbon dioxide at or above the exposure limits listed in the Fire Department Rules.

The business owner should obtain a copy of such reports (see example in the appendix at the end of this study material) and keep them on the premises. Business owners should also have the details initial install – specifically what was installed and the date of the installation.

1.4 TYPES OF PERMITS

Permit for Storage, Handling and Use of Carbon Dioxide (Site-Specific Permit)

A permit is required to store, handle, and use of carbon dioxide container(s) when the amount of carbon dioxide CO_2 gas/liquid is greater than **4,500 SCF**.



FIRE DEPARTMENT, CITY OF NEW YORK [redacted] BUREAU OF FIRE PREVENTION

ACCOUNT NUMBER	TYPE	A.P.	D.O.	ADM. CO.	ISSUANCE DATE	PERMIT EXPIRES
77777777	10	P	12	E284	01/28/10	01/11

PREMISES ADDRESS: 1111 YORK ST, STATEN ISLAND NY 11111

ACCOUNT NAME: CARI & RENO

ITEM CODE	SUB CODE	QTY	DESCRIPTION	FLOOR NO.	FEE
345	00	1	COMPRESSED GASES ONLY STR/USE	1	PAID

PERMIT TYPE: 1
1=REGULAR
2=SUPPLEMENTAL
3=DUPLICATE

CARI & RENO
1111 YORK ST
STATEN ISLAND NY 11111

ANNUAL FEE PAID

20111012938

BY ORDER OF THE COMMISSIONER

An example of an FDNY permanent permit

Such permit authorizes the permit holder to store, handle and use carbon dioxide at a specific premises or location. A site-specific permit is valid for 12 months only. Every permit or renewal shall require an inspection and shall expire after 12 months. The business owner must obtain this permit and post it on the premises.

- **FDNY TRANSPORTATION PERMIT**

A FDNY transportation permit is required to transport more than **4500 Standard Cubic Feet (SCF**) of compressed carbon dioxide gas in New York City. This includes a cargo tank truck delivering liquefied carbon dioxide for beverage dispensing systems.

The carbon dioxide supplier must obtain this permit, as explained below.

The FDNY transportation permit is a sticker and approval letter (see examples on next page) issued by the Fire Department Hazardous Cargo Vehicle Inspection Unit. The permit and the approval letter are issued at the inspection facility located at 35 Meserole Avenue, in the Borough of Queens, after the cargo tank truck passes a vehicle safety inspection.

The FDNY transportation permit (sticker) must be displayed on the tank truck. A copy of the approved variance and the approval letter (see page 14) shall be kept in the vehicle performing the dispensing operation at all times, and shall be presented to the FDNY upon request.

Permits are **not transferable** and any change in in the type of business or occupancy, or the ownership of the premises (including any new tenant or business operator), requires that a new site-specific permit be obtained.

Any change in the owner or operator of the vehicle requires that a new transportation permit be obtained.

Example of FDNY Transportation permit (sticker)

Month of inspection (will be punched), in this case February.

Year that the permit expires, in this case 2015.

EXAMPLE OF AN APPROVAL LETTER

FIRE DEPARTMENT

Hazardous Cargo Vehicle
Inspection Unit
245 Meserole Ave. Brooklyn, NY 11222
Phone: (718) 752-0296 / 0341 Fax: (718) 752 - 0402

Date: _____ **Account No.:**_____

Permit No.: _____
(Sticker No.)

Name & Address of Permit Applicant,

_____

_____

_____

The above referenced company has made an application for a (Transportation / Citywide) permit to Transport and or use:

_____,

And the Vehicle / Trailer was inspected satisfactorily on ___/___/___.

The approval applies only to the Vehicle / Trailer listed below:

Truck No._____ **Trailer No.**_____

Make of truck: _____ **Year:** _____ **Identification No.**_____

Make of trailer: _____ **Identification No.**_____

Inspected By: _____
Badge No.

Note: PERMIT EXPIRES (1) ONE YEAR FROM THE ABOVE DATE.

THIS LETTER SHALL BE CARRIED IN THE CAB OF THE TRUCK AND IT SHALL BE PRESENTED UPON REQUEST TO FIRE DEPARTMENT REPRESENTATIVE.

_____

Chief of Fire Prevention

2. DEFINITIONS

ASME CODE. American Society of Mechanical Engineers Boiler & Pressure Vessel Code.

ACGIH. The American Conference of Governmental Industrial Hygienists.

APPROVED. Acceptable to the authorities having jurisdiction.

CAPACITY. The amount of carbon dioxide the container will hold in pounds, tons, or kilograms under equilibrium conditions at normal operating pressure and temperature when dispensed with liquid to designed level.

CARBON DIOXIDE DETECTION AND ALARM SYSTEM. A system of components used to detect unsafe concentrations of carbon dioxide in the air and alert occupants. Such systems consist of sensors and audible and visual notification devices, and may have a control panel with a display.

CARBON DIOXIDE LEVEL GAUGE. Indicates the approximate quantity of liquid CO_2 inside the tank.

CARBON DIOXIDE STORAGE CONTAINERS. The vessel in which a compressed gas is stored.

CARBON DIOXIDE TANK PRESSURE GAUGE. Indicates tank pressure. Normal operation pressure is between 110 and 175 psi. Tank pressure may be as high as 300 psi after CO_2 delivery. Pressure gauge does NOT need to be on fill connections, however they are required to be on the fill nozzles.

DESIGN PRESSURE. Highest pressure that the inner pressure vessel is designed to sustain in operation at the maximum allowable working pressure (MAWP). This is the sum of the MAWP, static liquid head when full, and any outer vacuum pressure if vacuum insulated.

DISPENSING. The transferring of carbon dioxide from one container to another, including dispensing from a cargo tank truck to a storage container that is part of a stationary carbon dioxide beverage dispensing system.

DOTn. United States Department of Transportation.

EXCESS FLOW CONTROL. A fail-safe system or other approved device, equipment or system designed to shut off flow caused by a rupture in a pressurized piping system.

EXCESS FLOW VALVE. A valve inserted into a compressed gas container that is designed to shut off the flow of gas in the event that its predetermined flow is exceeded.

EXPOSURE LIMITS. Concentrations of carbon dioxide in the air that present hazards to human life and health:

PERMISSIBLE EXPOSURE LIMIT (PEL). Maximum amount or concentration (5000 ppm 8 Hour Time Weighted Average) of carbon dioxide that a worker may be exposed to under OSHA regulations.

SHORT-TERM EXPOSURE LIMIT (STEL). Concentration (30,000 ppm) of carbon dioxide to which workers can be exposed continuously for a short period of time without suffering from:

- irritation;
- chronic or irreversible tissue damage;
- narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency.

FILL BOX. The fill box is mounted on the outside of the facility and is used for filling the storage container with liquid carbon dioxide. It is equipped with a self-closing fill connection which allows the CO2 delivery person to easily fill the storage container. Filling does not require the delivery person to enter the facility. The fill box also serves as a vent location where CO2 gas from the storage container safety relief valve can be released harmlessly to the outside. The fill box is permanently connected to the storage container with a fill and vent hose. The fill box must be locked with a secure key. The fill box must be located away from the entrance to the premises so as to prevent the fill box from being struck by the entrance door. Each system must have its own fill box.

FILL LINE. Line connecting the fill box to the carbon dioxide storage container for transferring liquid carbon dioxide under pressure.

FINAL LINE (SUPPLY) REGULATOR. Controls pressure in supply line from tank to beverage equipment.

FINAL LINE (SUPPLY) REGULATOR GAUGE. Indicates supply pressure in the gas-use line. Final line (gas use) pressure is normally 90-115 psi.

GENERAL SUPERVISION. Supervision by the holder of any FDNY certificate who is responsible for performing the duties of the Certificate of Fitness holder but need not be personally present on the premises at all times.

HANDLING. The movement of a material in its container, the removal of the material from its container, or any other action or process that may affect the material, other than its storage or use.

HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term “health hazard” includes chemicals that are toxic, highly toxic and corrosive.

INCOMPATIBLE MATERIALS. Materials that, if mixed or combined, could explode, generate heat, gases or other byproducts, or react in a way hazardous to life or property.

MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP). The maximum pressure permissible at the top of a container in its operating position for a designated temperature, as established by the container manufacturer.

NESTING. A method of securing flat-bottomed containers upright in a tight mass using a contiguous three-point contact system whereby all containers within a group have a minimum of 3 points of contact with other containers, walls or bracing.

NONFLAMMABLE GAS. A gas that does not meet the definition of a flammable gas.

NORMAL TEMPERATURE AND PRESSURE. A temperature of 70°F and a pressure of 1 atmosphere.

PERSONAL SUPERVISION. Supervision by the holder of any FDNY Certificate of Fitness is required to be personally present on the premises, or other proximate location acceptable to the FDNY, while performing the duties for which the certificate is required.

PRESSURE RELIEF DEVICE. Device that activates by pressure to prevent pressure from increasing above a predetermined maximum.

PRESSURE VESSEL. A closed vessel designed to operate at pressures above 15 psig.

SAFETY DATA SHEET (SDS). A document prepared in accordance with the regulations of the United States Department of Labor, as set forth in 29 CFR Part 1910.1200 or a federally approved state OSHA plan which sets forth information concerning a hazardous material. It contains health and physical hazards of the material used, procedures that should be followed in case of an emergency and safety work practices. SDS does not show the cost of carbon dioxide.

STANDARD CUBIC FEET (SCF). Cubic feet of gas at normal temperature and pressure.

VENT LINE. High pressure line used to conduct gas from a pressure relief device (PRD) to a location outside the facility. Typically the vent line discharges to the atmosphere through a separate fitting in the fill box.

3. PHYSICAL CHARACTERISTICS AND COMMERCIAL USES OF CARBON DIOXIDE

3.1 PHYSICAL CHARACTERISTICS OF CARBON DIOXIDE

This section describes the different commercial uses to which carbon dioxide may be put.

Carbon dioxide may exist simultaneously as a solid, liquid and gas at a temperature of -69.9 F and a pressure of 60.4 psig, its “triple point.”

At temperatures and pressures below the triple point, carbon dioxide may be either a solid ("dry ice") or a gas, depending upon conditions. Solid carbon dioxide at a temperature of -109.3°F and atmospheric pressure transforms directly to a gas (sublimes) without passing through the liquid phase. Lower temperatures will result if solid carbon dioxide sublimes at pressures less than atmospheric.

At temperatures and pressures above the triple point and below 87.9 F, carbon dioxide liquid and gas may exist in equilibrium in a closed container. Within this temperature range the pressure in a closed container holding carbon dioxide liquid and gas in equilibrium bears a definite relationship to the temperature. Carbon dioxide can exist as a liquid only at the pressure between 60.4 psi and 1055.9 psi and temperature between -69.9 °F and 87.9 °F. Above the critical temperature, which is 87.9 F, carbon dioxide cannot exist as a liquid regardless of the pressure.

The physical characteristics as well as its special chemical properties all play a part in the widespread application of carbon dioxide in many diverse industries. The uses for carbon dioxide described in the following paragraphs are by no means complete but should serve to illustrate its versatility.

3.2 TRANSPORTATION AND INDUSTRIAL USES

In its solid form, carbon dioxide (dry ice) is very cold and readily absorbs heat from its surroundings. This makes it an ideal expendable refrigerant for shipment of perishable commodities. Granulated and mixed with product for rapid cooling, it facilitates the deflashing of rubber parts in tumbling barrels and the pulverizing of heat sensitive materials. It is also used to cold-treat metals, shrink-fit machined parts, chill cold traps, and quick freeze food products.

Design and installation requirements for bulk carbon dioxide systems for industrial applications are similar to the requirements for carbon dioxide beverage dispensing systems listed in Chapter 10 of this study material.

3.3 REFRIGERATING SYSTEMS

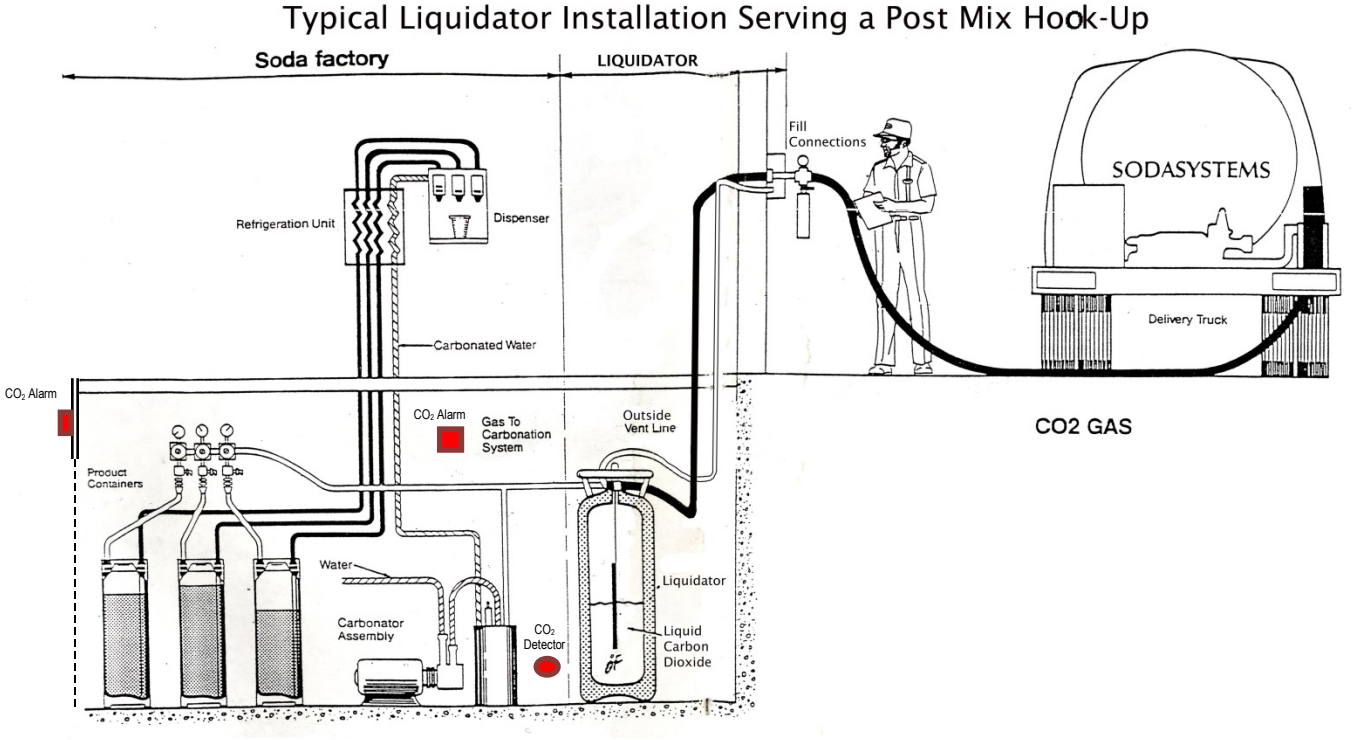
Liquefied carbon dioxide is used as a refrigerant in closed compression and absorption systems similar to ammonia. It is used as an expendable refrigerant for rapidly reducing temperatures in chambers or conveyor tunnels, for low temperature testing of mechanical and electronic components, and for food freezing. It is also used as a fire extinguishing agent in both portable and large scale bulk systems.

3.4 PORTABLE CONTAINERS

High-pressure portable containers (typically containing 20 or 50 pounds of carbon dioxide) are used in many small restaurants and bars to provide carbonation for drinks.

3.5 BEVERAGE DISPENSING SYSTEMS

Virtually every restaurant uses Carbon Dioxide (CO_2) in bulk form to carbonate soft drinks. There are three main ingredients in soda drinks: water, syrup and carbon dioxide gas. It is the carbon dioxide gas that is responsible for the fizziness.



A post-mix fountain beverage dispensing system is defined by delivering a heavy concentrated beverage base and a diluent for the concentrated syrup to a dispense nozzle, adding one or more of colors, flavors and any additives to the beverage base and diluent to provide a completed carbonated beverage, and delivering this drink

into a cup for service to a customer. This type of machine will always house the diluent separately from the concentrated syrup. The concentrate pump works in conjunction with a diluent pump to deliver the concentrate and diluent into a valve for mixing and dispensing of the final product with a higher level of consistency every time.

When a partially emptied bottle is recapped, more space is available for more carbon dioxide gas to escape solution, and the remaining liquid in the bottle becomes more flat. Because pressure cannot build up above an open bottle or cup, the soda in it will go completely flat within in a few minutes.

4. CARBON DIOXIDE HEALTH HAZARDS AND FIRST AID

This section describes the health hazards associated with carbon dioxide storage, handling and use.

Carbon dioxide is a compound of carbon and oxygen in proportions by weight of about 27.3 percent carbon to 72.7 percent oxygen. A gas at normal atmospheric temperatures and pressures, carbon dioxide is colorless, odorless and about 1.5 times as heavy as air.

Inhalation of a relatively low concentration (about 3%) can cause uncomfortable physiological effects on the human system which, though temporary, must be avoided. In larger concentrations, asphyxia can result.

4.1 HEALTH EFFECTS

The response to carbon dioxide inhalation depends on degree and duration of exposure, and it varies greatly even in healthy, normal individuals. The medical term for the physiological effects of excess carbon dioxide in the blood is hypercapnia.

Carbon dioxide can be dangerous even when normal oxygen levels are present. Low concentrations of carbon dioxide can be tolerated for a considerable period of time without noticeable effect or merely cause an unnatural feeling of shortness of breath. Inhalation of gaseous carbon dioxide can adversely affect body function. Skin, eye, or mouth contact with dry ice or compressed carbon dioxide can cause adverse effects.

Gaseous carbon dioxide is an asphyxiant. Concentrations of 10% or more can produce unconsciousness or death. Lower concentrations may cause headache, sweating, rapid breathing, and increased heartbeat, shortness of breath, dizziness, mental depression, visual disturbances and shaking. The seriousness of the latter manifestations depends on the concentration of carbon dioxide and the length of time the individual is exposed.

Skin or mouth contact with solid carbon dioxide or with gas or liquid carbon dioxide discharged from a container may result in frostbite, causing skin lesions or more serious injury from deep freezing of the tissues.

Eye contact with solid CO_2 or compressed CO_2 will cause corneal burn. Frostbite of the eye structure may also occur.

4.2 EXPOSURE LIMITS

Permissible Exposure Limit (PEL)

Occupational Safety and Health Administration (OSHA) regulations established an **8-hour** PEL of **5,000 ppm** for carbon dioxide. The PEL is the exposure limit that shall not be exceeded by the 8-hour time-weighted average in any 8-hour work shift of a 40-hour workweek.

Short Term Exposure Limit (STEL)

The American Conference of Government Industrial Hygienists (ACGIH) recommends a STEL of **30,000 ppm** for carbon dioxide. The STEL is the 15-minute exposure that should not be exceeded at any time during a workday.

4.3 FIRST AID

Do not attempt to remove the individual without utilizing proper rescue equipment or you may also become a casualty. If the exposed person is unconscious, obtain assistance and put into effect the established emergency procedures. If a person has inhaled large amounts of carbon dioxide and is exhibiting adverse effects, move the exposed individual to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

If solid CO_2 or cold CO_2 gas comes in contact with the skin or mouth, stop the exposure immediately. If frostbite has occurred, obtain medical attention. Do not rub the area. Do not apply heat warmer than 107 degrees Fahrenheit.

If solid CO_2 or cold CO_2 vapor comes in contact with the eyes, stop the exposure immediately and obtain medical attention.

5. CARBON DIOXIDE SAFETY

This section addresses safety information and precautions available to ensure safe carbon dioxide storage, handling and use.

5.1 SAFETY DATA SHEETS (SDS)

Safety Data Sheet (SDS) information should be readily available. The safety data sheet (SDS) contains specific information about the health and physical hazards of the material used, as well as safe work practices and required protective equipment. It may also describe the material's physical characteristics and procedures that must be followed in case of an emergency. For example, the SDS may list appropriate and inappropriate extinguishing agents. The Certificate of Fitness holder must refer to the SDS when questions arise about handling, usage, or storage of hazardous chemicals or materials. The SDS may also be requested by health care personnel to facilitate proper medical care in the event of chemical exposure.

5.2 PERSONAL PROTECTIVE EQUIPMENT

Certificate of Fitness holders should always wear heavy gloves and eye protection when there is a risk of exposure to carbon dioxide.

5.3 CARBON DIOXIDE DETECTION AND ALARM SYSTEM

All commercial and industrial premises in which carbon dioxide is stored, used and handled should be protected by a carbon dioxide detection and alarm system. (See Chapter 6 of this study material). Above ground installations can have either a ventilation system or CO_2 gas detection system. The ventilation system must be installed in accordance with the NYC Construction Code, including the Mechanical Code. In all instances a CO_2 gas detection system must be installed for systems below grade. CO_2 gas alarm detection systems shall be installed where vapors that accumulate can be detected.

5.4 LEAK PREVENTION

While small leaks are inherent in any gas system, those of significant size raise the level of economic and safety risk. It is best practice to have a daily routine of observing the CO_2 system at a time when there is no dispensing operations in process. Continuous presence of frost during non-business hours or in mornings before business hours indicates a demand for CO_2 gas perhaps caused by a leak in the beverage system.

5.4.1 CHECK FOR LEAKS

- The first observation should be of the pressure gauges of the inlet of the carbon dioxide gas. Should these pressure gauges read “very low” or “zero”,

there may be an out-of-gas situation. These pressures should be very similar to the pressures observed at the appropriate gas source. If there is a significant difference, there may be a leak in the lines between the gas source and the gas container.

- The next observation should be of the floats in the leak indicators. With no fountain soft drinks or draught beer being dispensed, these floats should be lower than the first line (0.1) on the indicators. If one or both are higher than this first mark, there could be a leak in one of the gas systems.
- The leak indicators can be used to isolate where that leak might be. By selectively closing the gas-out valves to the fountain soft drink system and the two draught beer gas blends and observing the reaction of the floats, operators can identify the system with the leak.
- If after closing a gas-out valve, the float for that gas sinks to the bottom of the indicator, then that gas system has a leak.
- The gas containers, valves, hoses, and related equipment should be inspected for physical damage. Special care should be taken to identify any defects that may cause a leak.
- Any defective components that are discovered must be marked and be replaced before the equipment may be used again. If any leak of gases is detected, that's where valves play a major role. They exist to isolate deficient components permitting service when and where needed. This equipment is very sensitive and must be repaired by a qualified repair specialist. The remaining components are non-critical.

If a compressed gas container leaks and the leak cannot be remedied by simply tightening a valve gland or packing nut, close the valve and attach a tag stating that the compressed gas container is unserviceable. Remove the leaking compressed gas container outdoors to a well-ventilated location.

5.4.2. LEAK TESTING

All piping joints and other connections shall be tested for leaks at time of installation using a soap solution or other equivalent product.

All containers, vent, fill and dispensing piping, and other system components shall be inspected for damages or signs of wear on an annual basis. Piping or other components that are not accessible for visual inspection shall be checked for pressure loss or other signs of deterioration, and replaced if there is evidence of deterioration in that piping or in other piping that was installed at or about the same time and is accessible for visual inspection.

First make sure that all connections are tight. Then open the container valve. If the installation has a leakage, frost-spots will begin to form. Keep in mind that liquid carbon dioxide will form dry ice (because of low temperature of the product) when there is a leak. The suspected fittings should be disconnected and cleaned. Then the connection is tightened and the checking procedure is repeated. If the frost-spots form again, there is a problem with the connection. The fittings should be repaired or replaced before the equipment is used again.

5.5 SPECIAL HAZARDS

Liquid carbon dioxide in a hose or pipe flows like water; however, when the pressure is reduced below **75.1 psia** the liquid changes into a mixture of vapor and solid carbon dioxide. Solid carbon dioxide, when formed in a pipe or hose, can create a plug and prevent depressurization this creates a safety hazard. To prevent dry ice blocking, liquid piping shall be pressurized with carbon dioxide gas more than 200 psig before introducing liquid carbon dioxide.

A dry ice plug can be ejected from any open end of a hose or pipe with enough force to cause serious injury to personnel, from the impact of the dry ice plug, or the sudden whip of the hose or pipe as the plug ejects, or both.

6. CARBON DIOXIDE DETECTION AND ALARM SYSTEM

This section describes the requirements for the carbon dioxide detection and alarm system that must be installed and signage that must be posted at premises where a low-pressure, liquefied carbon dioxide beverage dispensing system storing more than 100 pounds of carbon dioxide has been installed. Such system and signage is required by Fire Department Rule 3 RCNY 3004-01.

A carbon dioxide detection and alarm system should be installed at any other premises in which carbon dioxide is stored, handled and used, to detect the release of carbon dioxide at or above the short-term exposure limit (STEL) established by the ACGIH and the permissible exposure limit (PEL) established by the OSHA. Consult the website of the United States Department of Health and Human Service, Office of Safety and Health Administration for OSHA requirements. The link is as follows: https://www.osha.gov/.

The G-82 Certificate of Fitness holder is responsible for ensuring compliance with these requirements.

6.1 DESCRIPTION OF SYSTEM AND INSTALLATION

Carbon dioxide alarm system are equipped with audible and/or visual warning devices located in the area leading to the location of the leak detector to warn personnel of a hazardous condition before entering this location.

Central Unit Panel

The detection system may be equipped with a central unit panel, allowing for personnel to monitor the protected area for carbon dioxide leak remotely. If the panel is provided, it should not be installed in the same room or area as the carbon dioxide storage container installation or in a below-grade location that would potentially expose a person accessing the central unit panel to a carbon dioxide leak. The central control unit has to be installed in a location that is constantly attended and readily accessible in the event of activation of the system.

The typical carbon dioxide detection and alarm system does not require electrical wiring; it is plugged directly into an outlet.

CO_2 detection and alarm system components supplied with electrical power from a wall receptacle (outlet) must be protected against interruption of power supply by a plug lock, strap or other means of preventing the plug from being accidentally disconnected.

6.2 INSTALLATION REQUIREMENTS FOR BEVERAGE DISPENSING SYSTEM

All areas containing carbon dioxide storage containers, cylinders, piping and fittings and other areas where a leak of carbon dioxide can collect must be provided with either an approved type of mechanical ventilation system or carbon dioxide detection and alarm system. Where the storage containers are located below grade, a carbon dioxide detection and alarm system must be installed in all instances.

A carbon dioxide detection and alarm system has to be designed and installed for:

1) continuous monitoring of carbon dioxide beverage dispensing systems;
2) detecting the release of carbon dioxide at or above the short-term exposure limit (STEL) for carbon dioxide established by the American Conference of Governmental Industrial Hygienists (ACGIH) and the permissible exposure limit (PEL) for carbon dioxide established by the United State Occupational Safety and Health Administration and/or other regulatory agencies having jurisdiction; and
3) alerting building occupants to a release of carbon dioxide by activating a visual or audible alarm on the central unit panel, if any, and activating a visual or audible alarm notification device within each room or area requiring such system and outside of such room or area.

The system shall be listed and labeled by a nationally recognized testing laboratory when such devices become commercially available.

6.3 ALARM ACTIVATION

Carbon dioxide detection and alarm system typically will activate at the PEL and STEL levels, as follows:

PEL: 5,000 PPM Time Weighted Average (TWA) – Activates a visible and audible supervisory alarm on the central unit panel, if any, and on the detection device.

STEL: 30,000 PPM – Activates a visual and audible alarm on the central unit panel, if any, and activates a visual (amber strobes) and audible alarm notification device (horn) within the room or area requiring the CO_2 detection and alarm system and outside of such room or area.

Low-Level Alarm. Some carbon dioxide detection alarm systems activate a visible and audible supervisory alarm at a lower exposure level to alert building occupants to a carbon dioxide leak, and allow them to fix the problem.

7. SIGNAGE

This section describes the requirements for the CO_2 detection and alarm system signage that must be posted at premises where a low-pressure, liquefied carbon dioxide beverage dispensing system storing more than 100 pounds of carbon dioxide has been installed. Such system and signage is required by Fire Department Rule 3 RCNY 3004-01.

Similar signage, and any signage required by OSHA regulations, should be provided at all premises where there is carbon dioxide installation and storage, handling and use for which a G-82 Certificate of Fitness holder is responsible.

Additionally, Section 2703.5 of the New York City Fire Code requires posting of the NFPA hazardous materials diamond at all hazardous materials storage locations.

7.1 CARBON DIOXIDE DETECTION SYSTEM

A sign shall be posted adjacent to any CO_2 detection and alarm system central unit panel and each visual or auditory alarm notification device, setting forth warnings and instructions about alarm modes and, as applicable, supervisory signals and/or other information. (See image on next page for clarification of this sign.)

7.2 CO_2 STORAGE CONTAINERS ROOM/AREA

A warning sign shall be conspicuously posted at the entrance to the room or area containing the storage containers indicating the presence of carbon dioxide and the danger of asphyxiation. The warning sign shall read as set forth below. Alternative warning signs containing substantially similar information may be posted if approved by the Fire Department.

"WARNING – CARBON DIOXIDE GAS INSTALLATION – ASPHYXIATION DANGER

A high carbon dioxide (CO_2) gas concentration in this area can cause suffocation.

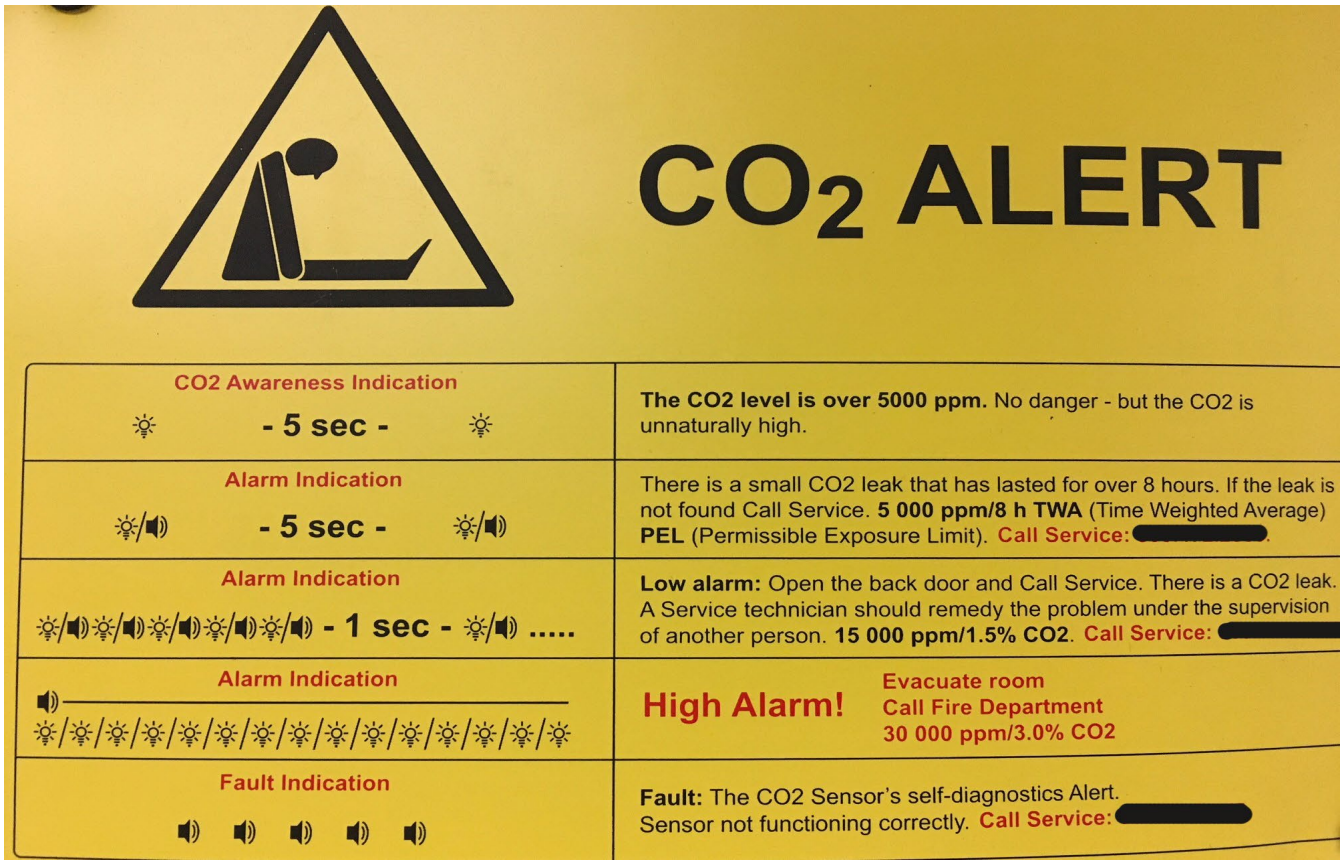
DO NOT ENTER ROOM/EVACUATE THE AREA:

- **if the CO_2 alarm indicates an immediate threat to life or safety. or**

if there is reason to believe there is a CO_2 leak and there is no functioning CO_2 alarm.

CALL NEW YORK CITY 911 IMMEDIATELY."

THIS SIGN IS TYPICALLY LOCATED NEXT TO THE BEACON OR CONTROL PANEL



7.3 NFPA 704 DIAMOND SIGN

The diamond-shaped sign is required by the NYC Fire Code to be conspicuously displayed at the entrance to locations where carbon dioxide gas/liquids are stored, handled and used.

The intent of the signage is to provide, at a glance, information about the type and severity of the hazards presented by hazardous materials. This is intended especially to assist first responders and others responding to hazardous materials released or other incidents.

This simple system uses symbols, colors and numbers to readily communicate these

NFPA Rating Explanation Guide

RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock
2	Can cause temporary incapacitation or residual injury	Must be heated or high ambient temperature to burn	Violent chemical change at high temperatures or pressures
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable
0	No hazard	Will not burn	Stable

RATING SYMBOL	SPECIAL HAZARD
ALK	Alkaline
ACID	Acidic
COR	Corrosive
OX	Oxidizing
	Radioactive
W	Reacts violently or explosively with water
W OX	Reacts violently or explosively with water and oxidizing

This chart for reference only - For complete specifications consult the NFPA 704 Standard

concerns in a visual manner, and recognizes the fact that a material may pose more than one type of hazard.

The basis of the system is a diamond-shaped sign that is divided into color-coded quadrants. The numbering system that is used to convey the hazards of a material uses a scale of 0 through 4 for each of the three hazard types (health, fire and reactivity). A number is placed in each box, specific to the material at hand. In each quadrant, a "0" represents the least concern and "4" represents the highest degree of hazard posed by a material. For instance, a "0" in the upper quadrant indicates a material that will not burn, while a "4" in the same quadrant indicates a gaseous material that will burn very readily. Intermediate numbers represent increasing levels of hazard in all categories, such as the "3" that is present in the "health" quadrant of the right figure above. This is indicative of a material that can cause permanent or serious injury upon exposure.

In the sign for carbon dioxide, the left-most quadrant is colored blue and represents the *health* hazard posed by the material. Carbon dioxide has a 3 in the health quadrant indicating that it "can cause temporary incapacitation or residual injury". The upper quadrant is red in color and indicates the relative *fire* hazard. Carbon dioxide has a 0 in the fire hazard quadrant, which indicates that it will not burn. The right-most quadrant is yellow and conveys the relative potential for *reactivity* of the material. Carbon dioxide has a 0 in the reactivity quadrant, which indicates that it is stable. The last quadrant, at the bottom, is white in color and serves to convey *"special"* information such as "OX" for oxidizer and "~~W~~" for water-reactive material. Carbon dioxide has no special hazards.

NFPA 704 SIGN FOR CARBON DIOXIDE

Handling and dispensing of carbon dioxide is accompanied in the NYC Fire Code by a requirement for the use of consistent signage to alert first responders and other emergency personnel for the presence of hazardous materials in a facility.

8. STAFF TRAINING

This section describes the training that the G-82 Certificate of Fitness holder must provide to the business staff where a low-pressure, liquefied carbon dioxide beverage dispensing system storing more than 100 pounds of carbon dioxide has been installed. Such training is required by Fire Department Rule 3 RCNY 3004-01.

Similar staff training, tailored to the type of carbon dioxide installation and storage, handling and use of carbon dioxide on the premises, should be provided at all premises for which a G-82 Certificate of Fitness holder is responsible.

8.1 CARBON DIOXIDE BEVERAGE DISPENSING SYSTEM REQUIREMENTS

At time of installation of a carbon dioxide beverage dispensing system, and at least once a year thereafter, the installer or other G-82 Certificate of Fitness holder associated with the company servicing the carbon dioxide beverage dispensing system shall verbally and in writing communicate the following carbon dioxide safety information to the business owner and/or other responsible persons at the premises.

(A) Asphyxiation and extreme temperature hazards associated with carbon dioxide release;

(B) Identification of each of the carbon dioxide beverage dispensing system components, including fill box, piping, containers, central unit panel, and visual and audible alarm notification devices, and a basic description of system operation;

(C) Importance of keeping system components free from physical damage or obstruction, including damage or obstruction from stored items;

(D) Importance of immediately reporting to the G-82 Certificate of Fitness holder any damage to, or malfunction of, the system and ensuring that the system is inspected, and if necessary, repaired, on an expedited basis, and

(E) Importance of immediately reporting and acting upon any release of carbon dioxide.

9. RECORDKEEPING

This section describes the recordkeeping that the business owner or G-82 Certificate of Fitness holder must maintain where a low-pressure, liquefied carbon dioxide beverage dispensing system storing more than 100 pounds of carbon dioxide has been installed. Such recordkeeping is required by Fire Department Rule 3 RCNY 3004-01.

Similar recordkeeping should be maintained at all premises for which a G-82 Certificate of Fitness holder is responsible for carbon dioxide storage, handling and use.

The business owner or G-82 Certificate of Fitness holder shall maintain on the premises for at least three (3) years the following documentation:

For all installations over 100 lbs -

(1) A tag or other record of each quick check and annual inspection indicating:

  (A) The date of the inspection;

  (B) Whether the system is in good working order, and, if not, any conditions that require correction, and, if so, the date the condition was corrected and by whom; and

  (C) The name and certificate number of the certificate of fitness holder who performed the inspection;

(2) The names and titles of the responsible person(s) at the premises trained in the use of the system;

(3) A copy of the manufacturer's manual for the carbon dioxide beverage dispensing system.

For installations over 400 lbs (in addition to (1), (2) and (3) above) -

(4) When required by the Fire Department rule, a copy of the Installer's Affidavit for new and altered systems;

(5) When required by the Fire Department rule, a copy of the Installer's Affidavit for any emergency alarm activation/ carbon dioxide release;

Any alteration (including replacement of piping) or repair after activation of an emergency alarm or other release of carbon dioxide to need to a carbon dioxide beverage system a "Carbon Dioxide Beverage Dispensing System Installer Certification of Installation, Alteration or Repair and Incident Reporting Form" must be completed by a carbon dioxide system installer holding a FDNY Certificate of Fitness for Carbon Dioxide Systems (G-82).

This form can be found in the Appendix to this study material as well as on the FDNY website. The website form is a fillable PDF form and can be electronically submitted. If the form is downloaded onto a computer and completed, it must be emailed to FDNY at districtofficeheadquarters@fdny.nyc.gov. For information, contact FDNY District Office Headquarters at (718) 999-2457/2458.

10. DESIGN AND INSTALLATION REQUIREMENTS FOR CARBON DIOXIDE BEVERAGE DISPENSING SYSTEMS

Carbon dioxide beverage dispensing systems shall be designed and installed in accordance with International Fire Code Section 5307 (2015 edition), Chapter 13 of NFPA Standard 55 (2016 edition), and any other applicable standards, as set forth in NYC Fire Rule 3 RCNY 3004-01, Section 3004-01.

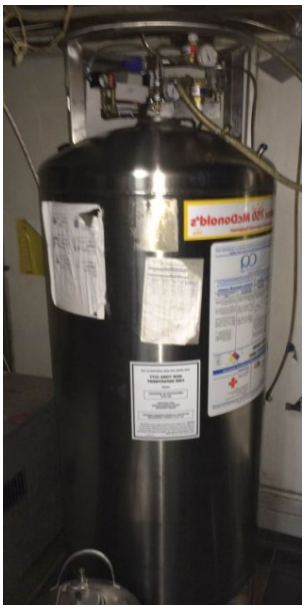
The systems shall be installed so that the storage containers, cylinders, piping and fittings are protected from damage by occupants or equipment during normal facility operations.

Low pressure carbon dioxide supply systems located at consumer sites usually consist of:

a. Specially designed storage containers;
b. Pressure and level indicators;
c. Fill connection;
d. Piping system;
e. Pressure relief devices;
f. Pressure regulators;
g. Carbon dioxide detection and alarm system, and
h. Other equipment (may be included to meet the requirements of certain installations).

10.1 STORAGE CONTAINERS

The containers storing carbon dioxide must be of a design certified as compliant with ASME or USDOT standards, and for storage of low pressure, liquefied carbon dioxide. Storage containers shall be installed at a location readily accessible for servicing and reading of gauges (on the foundation or floor capable of supporting the weight of the carbon dioxide system at full capacity). The containers must not be located at any location that would obstruct means of egress, fire protection systems, ventilation systems, or access to gas meters and other utility closets and panels. Where feasible, storage containers shall be installed at or above grade level.



The storage container has a vacuum insulated stainless steel pressure vessel located inside a stainless steel outer jacket. The insulation prevents the cold liquid CO_2 from boiling away. It includes an automatic pressure building system to maintain adequate CO_2 gas withdrawal. The storage container is protected from damage because of excessive pressure by a primary and secondary relief device that vents outside into the fill box. A vent

pipe has to vent to the outside air and it should be unobstructed.

10.1.1 INDOOR STORAGE CONTAINERS

1) Carbon dioxide containers are generally filled from large cargo tank trailers; therefore, their location should provide easy access to driveway large enough for these delivery units.
2) Containers should be placed as close to the fill box as possible to maximize filling efficiency.
3) Containers should not be located in an area where they are subjected to temperatures above 125°F.
4) Storage areas shall be well drained and well ventilated. Dusty, oily, and corrosive locations should be avoided.
5) Containers should be properly secured using safety chains, nesting, or other protective devices to prevent them from overturning.

10.1.2 OUTDOOR STORAGE CONTAINERS

Carbon dioxide storage containers for carbon dioxide beverage dispensing systems may be installed outdoors with prior Fire Department approval. Application for approval of the installation shall be made to the Technology Management Unit of the Bureau of Fire Prevention, and shall include a site diagram and photographs showing the proposed location of the installation, distances to all building entrances, openings and lot lines, below-grade areas (including manholes), adjoining property uses, security measures, and such other information and documentation as the Fire Department may require.

10.2 PRESSURE AND LEVEL INDICATORS

Each storage container must be provided with a pressure and level devices to indicate pressure and quantity of liquid carbon dioxide in the tank.

Pressure Indicator

Level Indicator

10.3 FILL CONECTION

Each carbon dioxide storage system must have its own fill connection and related piping. Fill connections must be in a lockable box and permanently mounted on a wall outdoors. The fill connection and fill vent shall not be located in or above any below-ground spaces or stairwells. There is no horizontal distance requirement. If installation of a fill connection is not practicable at particular premises, application shall be made for modification of the provisions of the Fire Rule before installing any carbon dioxide beverage dispensing system. Approval of such installation shall be subject to such additional safety requirements as the Department may require.

10.4 PIPING SYSTEM

Materials for piping system shall be compatible with carbon dioxide and rated for the temperatures and pressures encountered in the system.

Material specifications should also take into consideration and be rated for environmental conditions encountered where the system is installed. Stainless steel, copper, brass, and some properly rated plastic/polymer materials are suitable for these systems. Plastic/polymer hoses and components that release plasticizers causing contamination in beverage systems shall not be used. Cast iron or galvanized materials shall not be used in these systems.

The system design also needs to encounter the effects of expansion, contraction, vibration, physical damage and heat sources. All hoses and tubing used in carbon dioxide service shall be designed for a bursting pressure of at least four times their design pressure.

Carbon dioxide piping shall be run as directly as practical and be adequately supported to prevent undue strain on the piping or fittings.

10.5 PRESSURE RELIEF DEVICES (PRD)

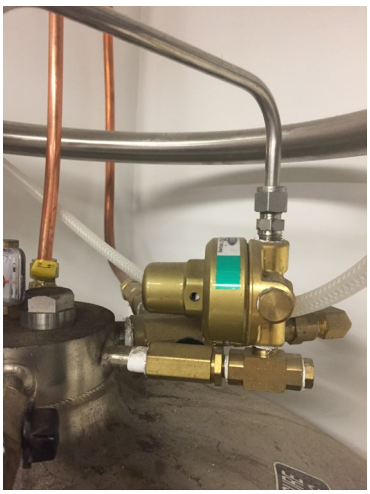
A volume of liquid carbon dioxide will expand as it warms. If it is forced to occupy a fixed volume, the internal pressure increases as the liquid warms and expands. As the temperature continues to increase, the pressure of the trapped liquid can exceed what the piping and hoses can withstand. This can cause the rupture of the hose or piping with possible injury and property damage.

To prevent trapped liquid from becoming a hazard, all liquid carbon dioxide piping and transfer lines shall be equipped with pressure relief devices located in all part of the system in which liquid can be trapped.

Containers used for liquid carbon dioxide also need to be equipped with PRDs piped from the uppermost part of the containers and piped to a safe outdoor location.

PRDs must be located to minimize tempering, damage, and obstruction to flow. The inlet and outlet of the relief devices shall not be blocked by a valve or a plug during normal operation.

10.6 CARBON DIOXIDE PRESSURE REGULATORS



Pressure-reducing regulators are required when carbon dioxide vapor is required at pressures below storage pressures. Carbon dioxide gas pressure regulators are not designed for liquid service. When liquid inadvertently passes through a carbon dioxide gas regulator, the resulting dry ice can damage the regulator. This can occur if the container is overfilled or the piping passes through a low temperature area of less than 0°F. A pressure relief device should be installed downstream of the carbon dioxide regulator to protect against over pressurization caused by regulator failure.

11. DELIVERY OF CARBON DIOXIDE

To minimize delivery expense, delivery frequency should be scheduled to allow a 200-500 pound delivery; depending on tank size. For most restaurants, this will be every 20-30 days. Delivery routes are typically planned to minimize travel time and "rush-hour" traffic situations.

1. Delivery vehicle pressure must be maintained at 280-300 psi for proper operation. Low delivery pressure can cause 45-50 minute fill times.
2. A delivery pressure of 50 psi higher than the restaurant storage container pressure should be maintained during filling. A low pressure differential will cause long fill times.
3. A delivery log for each account should be maintained to help detect irregularities in CO_2 consumption.
4. Adjust delivery program to longer intervals between deliveries as consumption justifies.

11.1 INITIAL FILL

It shall be unlawful to fill from a cargo tank any carbon dioxide container in a beverage dispensing system, except through a fill connection installed in accordance with the provisions of the Fire Rule and any other applicable standards. A container that has been out of carbon dioxide service, opened to the atmosphere, or newly installed, shall be properly purged with carbon dioxide vapor before filling.

All water and contaminant gases shall be removed before filling, or the carbon dioxide distribution chain could become contaminated.

A typical method of purging a tank is to alternately pressurize the container with carbon dioxide vapor from a cargo tanker and then:

1) Vent from a tip connection to the atmosphere. Repeated pressurization and depressurization dilutes impurities to acceptable levels.
2) Do not use liquid carbon dioxide for purging and pressurization because it thermally shocks the pressure vessel and could lead to catastrophic failure.
3) Pressurize the container with carbon dioxide vapor to 200 psig after completing the initial purge and before introducing any liquid.

Since the inner tank of a new CO_2 storage container is relatively 'warm', its first fill may take 20-30 minutes and a larger than normal amount of CO_2 gas will be vented during the fill. A higher-than-normal operating pressure can be expected for several days after the first fill.

11.2 DISPENSING PROCEDURES

Container dispensing is usually accomplished by pumping liquid carbon dioxide into the container to the desired net volume. The transfer of liquid CO_2 from one CO_2 container to another may be performed by direct transfer or by means of pressure differential or by a pump. Below dispensing procedures apply to the single hose filling of CO_2 beverage dispensing containers.

The following transfer procedure shall be followed for filling CO_2 low pressure beverage dispensing systems:
a) Park delivery vehicle adjacent to the filling connection and set the parking brake;
b) Place chocks under the wheels to prevent unintended vehicle movement;
c) Inspect the connections for cleanliness and wipe them with a clean towel if necessary;
d) Connect the transfer hose to the fill connection and purge as needed. Prior to starting product transfer, ensure that there is a positive pressure maintained between the fill connection and the pressure vessel.
This typically is accomplished by one of the following methods:

- A functional pressure gauge equipped on the filling equipment connected to the fill box on the outside of the building or

- Opening the blow-down valve on the filling equipment to confirm that a positive pressure has been maintained inside the fill connection:

e) Open the fill valve to start the transfer.

- When the container becomes full, a ball float that has been lifted by the rising liquid seats in the inlet to the filling regulator. When the container and delivery vehicle pressure equalize, the transfer is complete. Verify that the venting gas is flowing from the vent line outlet in the fill box. If no vent flow is observed. stop filling and investigate why the vent gas is not flowing to the outside

f) Close the fill valve and bleed liquid from the hose;
g) Disconnect the transfer hose and return the hose to the stored position;
h) Close the transport container supply valve and properly purge any remaining liquid with a vapor purge;
i) Depressurize the fill hose and piping before operating the transport vehicle; and
j) Remove the wheel chocks.

11.3 VENTING

Pressure relief devices shall be provided with the vent lines piped to a safe outdoor location. Vent lines shall be sized and arranged so as not to restrict the discharge of the pressure relief device.

11.4 OVERFILLING OF CONTAINERS

When the container becomes liquid full, the hydrostatic pressure rises at the rate of 850 psi per °F. Small, portable containers are not equipped with refrigeration. All storage containers can potentially become liquid full; however, this must be avoided. To prevent undue stresses to the container and nuisance cycling of the PRD (pressure relief device) with consequent product loss, liquid carbon dioxide storage containers should not be filled to a level that allows them to become liquid full before reaching the PRD setting, which is generally 350 psig.

The safe filling level depends on the temperature of the liquid being transferred into the container. The colder the liquid, the more vapor space required for liquid expansion. Under some circumstances it is possible to overfill bulk carbon dioxide containers. Typical reasons of over filling include refrigeration unit operating but not decreasing pressure, erratic level gauge operation, and excessive frost on vapor lines.

12. STORAGE AND HANDLING OF CARBON DIOXIDE CONTAINERS

12.1 STORAGE

Containers must always be stored in the assigned location.

Compressed gas containers and systems shall be secured and protected against physical damage and tampering. Compressed gas containers and systems that could be exposed to physical damage shall be protected. Posts or other approved means shall be provided to protect compressed gas containers and systems indoors and outdoors from vehicular damage. Never use the containers as rollers, supports, or for any purpose other than to contain the content as received.

Compressed gas containers are allowed to be stored or used in direct sun light except in locations where extreme temperatures prevail. Containers shall be protected from direct contact with soil or unimproved surfaces to prevent bottom corrosion. The surface of the area upon which the containers are placed shall be graded to prevent accumulation of water. When extreme temperatures prevail, overhead covers shall be provided. Overhead covers shall also be provided to prevent accumulations of ice and snow on the valves of containers connected for use.

Containers should be chained to a bulkhead or other suitable structure to prevent them from falling over. Container should be stored in dry well-ventilated locations. Ventilation systems should be designed to exhaust from the lowest point.

When liquid carbon dioxide is stored in a container and there is no product withdrawal, heat leak causes the temperature and pressure to rise and the liquid to expand. As long as there is a vapor space in the container, the pressure rises approximately 5 psi per °F.

12.2 REMOVING CONTAINERS FROM SERVICE

Leaking, damaged or corroded compressed gas containers shall be removed from service under the personal supervision of a G-82 Certificate of Fitness Holder.
When empty containers are removed from service, their valves should be tightly closed to prevent air or moisture from entering them while they are being returned to the producer for re-dispensing.

A container that will be out-of-service at a consumer site for any period of time shall be maintained in a pressurized condition. If so equipped, the refrigeration unit shall be inspected before putting it back in service if it did not operate during the time the container was out of service. If the container has been depressurized or has been open to the atmosphere, other than for immediate repair or maintenance while out of service, an internal inspection is required.

12.3 HANDLING

G-82 Certificate of Fitness holders should be trained in the proper handling of carbon dioxide containers. They should also be informed of the hazards involved when approved procedures are bypassed, altered, or ignored.

THERE SHOULD BE A LOGBOOK ON THE PREMISES STATING:

- Delivery dates
- Persons making deliveries and their Certificate of Fitness number
- Safety check of system and condition of system
- Truck Delivery Pressure

Since the pressure in a closed vessel containing carbon dioxide will increase with a rise in temperature, the possibility always exists that a container charged at a safe pressure at normal temperatures might reach a dangerously high pressure at high ambient temperatures. To prevent this from happening with normal usage, U.S. Department of Transportation regulations limit the amount of carbon dioxide that may be charged into a container.

The container, appurtenances and piping shall be protected against physical damage from moving vehicles or other hazards. All the piping and appurtenances shall be free of water, oil, grease, and other foreign matter before placing the system in service.

13. QUICK CHECK AND ANNUAL INSPECTION

13.1 QUICK CHECK

The Fire Department Rule 3 RCNY Section 3004-01 requires periodic inspection and testing of carbon dioxide beverage dispensing systems. Similar inspection and testing should be conducted for other carbon dioxide systems.

A quick check of the carbon dioxide beverage dispensing system shall be conducted by the G-82 Certificate of Fitness holder each time the carbon dioxide container is filled, if feasible, but in any event not less than once every 3 months. The quick check shall consist of a visual inspection of:

(A) the pressure gauge on the storage container(s), to confirm that the pressure of the liquid carbon dioxide is within normal range;

(B) system components, to detect any sign of physical damage, frost build-up on the regulator or other visible evidence of component malfunction;

(C) any central unit panel of the carbon dioxide detection and alarm system, to confirm that the system is powered and operating properly, as well as to check for any system faults and activate any system test, including any test of alarm modes (as per manufacturers recommendations);

(D) the required warning sign, to confirm that it is posted, legible and not obstructed;

(E) the room or area in which the carbon dioxide storage container(s) is installed, to confirm that there are no obvious unsafe conditions, such as storage of items on or against the container(s) or piping.

13.2 ANNUAL INSPECTION

A full inspection of the carbon dioxide beverage dispensing system shall be conducted by a G-82 Certificate of Fitness holder at least once a year. All containers, vent, fill and dispenser piping, and other system components shall be inspected for damage or signs of wear. Any components not in good working order shall be repaired or replaced. Piping or other components that are not accessible for visual inspection shall be checked for pressure loss or other signs of deterioration, and replaced if there is evidence of deterioration in that piping or in other piping that was installed at or about the same time and is accessible for visual inspection.

14. SYSTEM MAINTENANCE AND REPAIRS

Systems shall be maintained in accordance with manufacturer's instructions. The system shall be maintained by a G-82 Certificate of Fitness holder only.

- Frost spots, leaks, or any other indication of a possibly unsafe conditions; such as mechanical damage or corrosion shall be corrected by repairs or replacement of the faulty component.
- Each storage container shall be provided with a pressure gauge and a device for indicating the quantity of carbon dioxide.
- Connections to the containers necessary for proper operation of the system shall have shutoff valves. Three-way valves must be utilized to facilitate inspection, repair or replacement of dual pressure relief devices.
- The valves shall be located as close to the container as practicable. Connections not in use shall be plugged or capped.
- Care shall be exercised to avoid damage to pressure relief devices. Care shall also be exercised to avoid plugging by paint and dirt accumulations on pressure relief device channels or other parts which could interfere with the functioning of the device.
- If the start-to-discharge pressure is not within the limits required for the application and marked on the valve, it shall be repaired or replaced.
- Each pressure relief device shall be tagged and dated at the time of testing.
- If the service of the carbon dioxide container is such that there is reason to believe corrosion has taken place to the pressure vessel or that cracking or other unsafe conditions may be present, contact the container manufacturer.
- If such evidence is noted or suspected, a more rigorous inspection shall be performed by the tank manufacturer or a person trained and authorized by the tank manufacturer holding a G-82 Certificate of Fitness, using modern commercial detection methods. Necessary repairs to the pressure vessel must be performed by qualified personnel.

If any unsafe condition is found during an inspection, the condition shall be promptly corrected, or the system shall be taken out of service until the condition can be corrected.

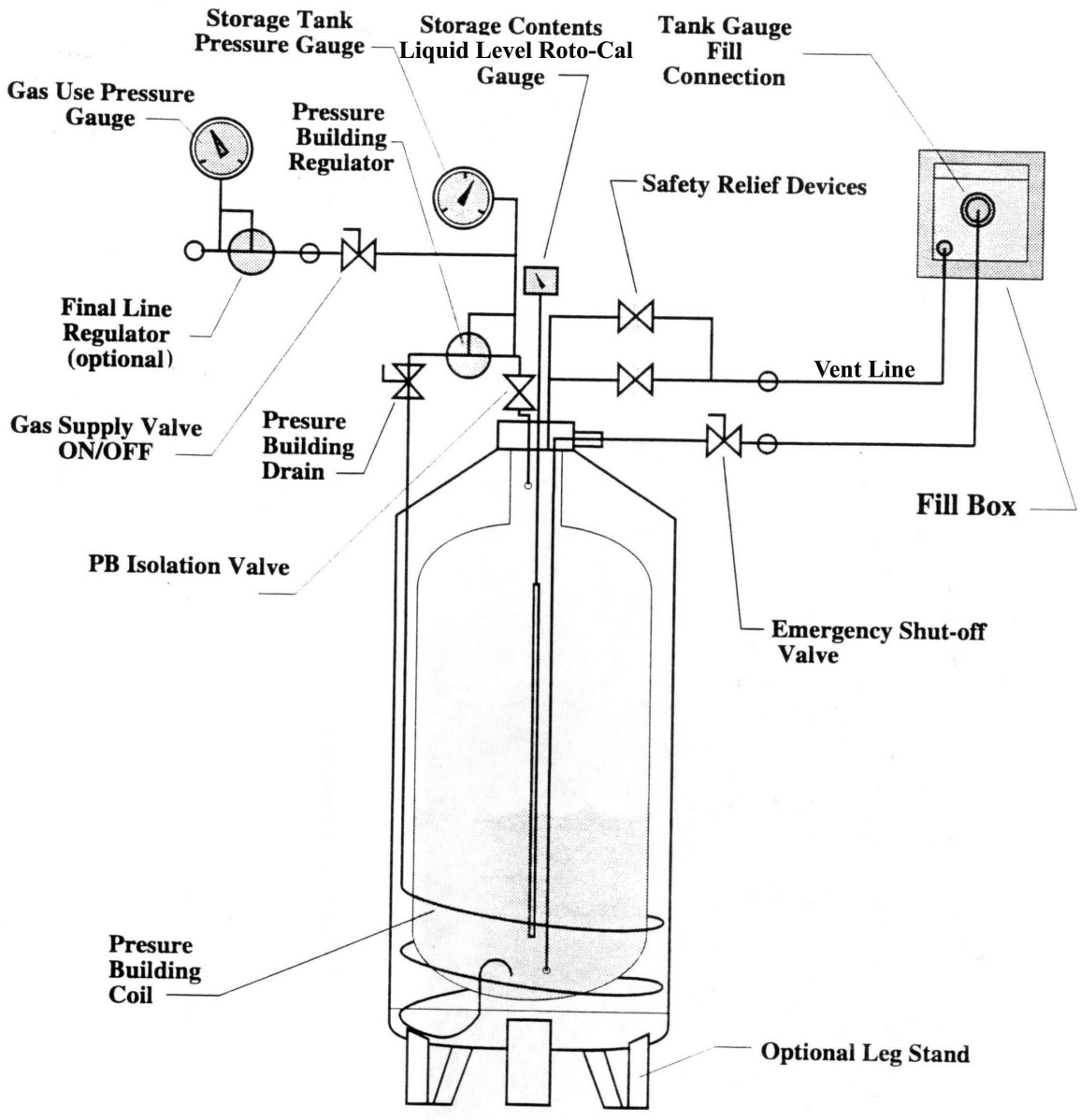
After the new container has been connected to the appliance, all connections must be checked for leaks. Most of these leaks occur at the top of the container in areas such as the valve threads, pressure safety device, valve stem and valve outlet.

Any alteration (including replacement of piping) or repair after activation of an emergency alarm or other release of carbon dioxide to need to a carbon dioxide beverage system a "Carbon Dioxide Beverage Dispensing System Installer Certification of Installation, Alteration or Repair and Incident Reporting Form" must be completed by a carbon dioxide system installer holding a FDNY Certificate of Fitness for Carbon Dioxide Systems (G-82).

This form can be found in the Appendix to this study material as well as on the FDNY website. The website form is a fillable PDF form and can be electronically submitted. If the form is downloaded onto a computer and completed, it must be emailed to FDNY at districtofficeheadquarters@fdny.nyc.gov. For information, contact FDNY District Office Headquarters at (718) 999-2457/2458.

15. RELATED EQUIPMENT

CO_2 SYSTEM COMPONENTS



CONTROL VALVE
A control valve is on the top of each container. This valve can be opened or closed to control the discharge of the contents of the gas or liquid container. A handle is simply turned to control valve. The control valve must be opened by hand. Container valves shall be closed before moving a container.

PIPING SYSTEMS
(1) Piping, hose, fittings and other equipment that comes in contact with carbon dioxide shall be metallic, certified by the manufacturer as suitable for carbon dioxide use and for the operating temperature and maximum operating pressure of the carbon dioxide system. For soda carbonation installations, the hose from the dispenser regulator to the dispenser may be nonmetallic, provided the operating pressure is less than 125 psig.

(2) Dispense and vent lines shall be approved piped and designed to withstand a temperature of **-109.3°F**.

(3) Valves, pressure regulators and pressure relief devices shall be suitable for carbon dioxide use and rated for the operating temperature and maximum operating pressure of the carbon dioxide system.

(4) Piping pressure relief devices shall be provided where liquid carbon dioxide can become trapped in the piping system. Pressure relief devices and vent lines from pressure relief devices shall not be provided with shut off valves or other obstructions which could render such valves inoperable.

(5) Pressure relief devices shall be provided on all containers used for liquid carbon dioxide and piped from the uppermost part of the container to the outdoors.

(6) Vent lines from pressure relief devices shall be of such a size, length and arrangement so as not to interfere with the proper operation of the valves. The size of the vents of pressure relief devices shall be equal or larger in size than the pressure relief device outlet size.

(7) For soda carbonation installations, the **dispenser pressure regulator** shall be designed to fail in the closed position.

(8) Piping shall be securely supported and braced, and installed with due allowance for thermal expansion and contraction. Expansion joints shall not be used. Piping shall be protected from physical damage.

(9) Insulation for carbon dioxide containers and ancillary equipment shall be of a noncombustible material.

(10) The regulator is connected to a hose that supplies the product to the appliance. This hose must be securely connected to the appliance. **Hoses must be as short as practical to protect hoses from damage**. Hoses are used to connect pieces of equipment subject to vibration or that require the ability to change position. They should not be used as a substitute for permanent piping.

(11) Hose and hose fittings shall be made of materials suitable for use with carbon dioxide. All hoses used in carbon dioxide service shall be designed for a bursting pressure of at least four times the pressure to which they may be subjected in service. Hose assemblies should be inspected at regular intervals for damage such as kinks, cracked or blistered inner liners, or damaged reinforcing braid. It is recommended that hoses be date stamped when purchased to allow for periodic replacement. Check for evidence of swollen, cracked, or defective inner liner and replace such hoses immediately. Evidence of such damage could be frost spots or leaks on the outer surface of the hose, pieces of elastomeric liner material being discharged from the hose, or higher than normal pressure losses in the hose.

(12) Piping, tubing, pressure regulators, valves and other apparatus shall be kept gas tight to prevent leakage. Valves utilized on compressed gas systems shall be suitable for the material and temperature intended and shall be accessible. **Valve handles shall not be removed or otherwise altered to hinder operation**.

The following types of pipe and fittings are not acceptable for liquid carbon dioxide service:

- Type F furnace butt welded steel pipe;
- Cast iron or malleable iron fittings and pipe;
- Cadmium plating for food service;
- A-120 galvanized steel pipe (A-106 galvanized is acceptable);
- Plastic pipe and fittings; and
- Carbon steel tubing (limited by external corrosion).

(13) Readily accessible **manual valves**, or **automatic remotely-activated fail-safe emergency shutoff valves**, shall be installed on supply piping and tubing at the point of use and at the tank, container or other source of supply.

(14) Emergency shutoff valves shall be clearly visible and readily accessible. A durable sign shall be conspicuously posted immediately adjacent to such valves to identify their location. Backflow prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials. In an emergency the flow of CO2 from or through the storage container can be stopped by closing the red-handles valves marked with the Emergency Shut-Off labels.

Where gases having a hazard ranking of health hazard Class 3 or 4, or reactivity Class 3 or 4 in accordance with NFPA 704 are conveyed in pressurized piping above 15 pounds per square inch gauge, an approved means of leak detection and

emergency shutoff or excess flow control shall be provided. Where the piping originates from within a hazardous material storage room or area, the excess flow control shall be located within the storage room or area. Where the piping originates from any other source of supply, the excess flow control shall be located as close to the source of supply as practical.

Exceptions:

1. Piping for inlet connections designed to prevent backflow.
2. Piping for pressure relief devices.

Supply piping and tubing for gases having a health-hazard ranking of 3 or 4 in accordance with NFPA704 shall be in accordance with ANSI B31.3.

16. LITHIUM-ION BATTERY SAFETY

Lithium-ion safety

Lithium-ion batteries are rechargeable batteries found in electric bikes, scooters, cars, laptops, tablets, phones, and many other common household devices.

Lithium-ion battery fires have caused deaths, serious injuries, and devastating damage to property around the city. It's important to follow rules for safe storage, charging, and disposal for these types of batteries.

If you own a lithium-ion powered device or plan to buy one, the FDNY has important safety tips that you should follow. These tips apply to all devices powered by lithium-ion batteries, including phones, tablets, laptops, e-cigarettes, toys, high-tech luggage, and even robotic vacuum cleaners.

Immediately stop using or charging battery and call 911 if you notice:

- **Fire or Smoke**
- **Overheating**
- **Change in color or shape**
- **Odd noises**
- **Leaking**
- **Strange smell**

ALWAYS:

- purchase and use devices certified by a Nationally Recognized Testing Laboratory (NRTL).
- follow the manufacturer's instructions for:
  - charging and storage.
  - correct battery, cord, and power adapter
- keep exit path clear at all times.
- plug directly into a wall electrical outlet for charging.
- keep batteries and devices at room temperature.
- store and/or charge batteries away from anything flammable.
- keep away from heat sources.
- bring batteries to a **NYC Battery Recycling Center.** Visit nyc.gov/batteries for more information.

NEVER:

- use aftermarket batteries or chargers.
- use damaged or altered batteries
- plug into a power strip or overload an outlet.
- overcharge or leave battery charging overnight.
- charge a battery or device under your pillow, on your bed, or near a couch.
- leave e-bikes or e-scooters unattended while charging.
- block your primary way in or out of a room/space with e-bikes, e-scooters, wheelchairs, etc.
- place batteries in Trash or Recycling bin. **It is ILLEGAL.** Visit nyc.gov/batteries for disposal locations and information.

In the event of a Fire,
Leave and CLOSE the door.
Call 911 once you are in a safe location.

Charging Lithium Ion

Lithium-ion batteries do not have to be fully charged; partial charge is the most suitable.

When **charging more than five (5)** personal mobility devices or their removable batteries, it must be in a **dedicated room with ventilation** and a self-closing door.

For a total battery capacity of 20 kilowatt-hours (kWh), a 2-foot separation between charging batteries is required. For a total battery capacity up to 50 kWh, a 3-foot separation is needed.

Chargers must only be used with a compatible battery pack. The original equipment manufacturer (OEM) charger interplays with the battery pack using the battery management system (BMS). The wrong battery/charger combination may not work safely. For example, the 100% cutoff to prevent overcharging, which damages batteries, may not work which can easily create hazardous conditions such as fires, explosions and/or injuries.

Always check with the manufacturer or retailer of the personal mobility device, an authorized repair shop or a testing laboratory such as Underwrites Laboratories (UL) to see if replacement is recommended or listed and safe for use with that device. Using unauthorized parts, including batteries and/or chargers, may cause damage, fire and possibly void your warranty.

Extinguishing Lithium-ion

Water may not prevent a battery from burning and spreading. Battery cells are known to explode and quickly spread to another battery. It can spread to another devices.

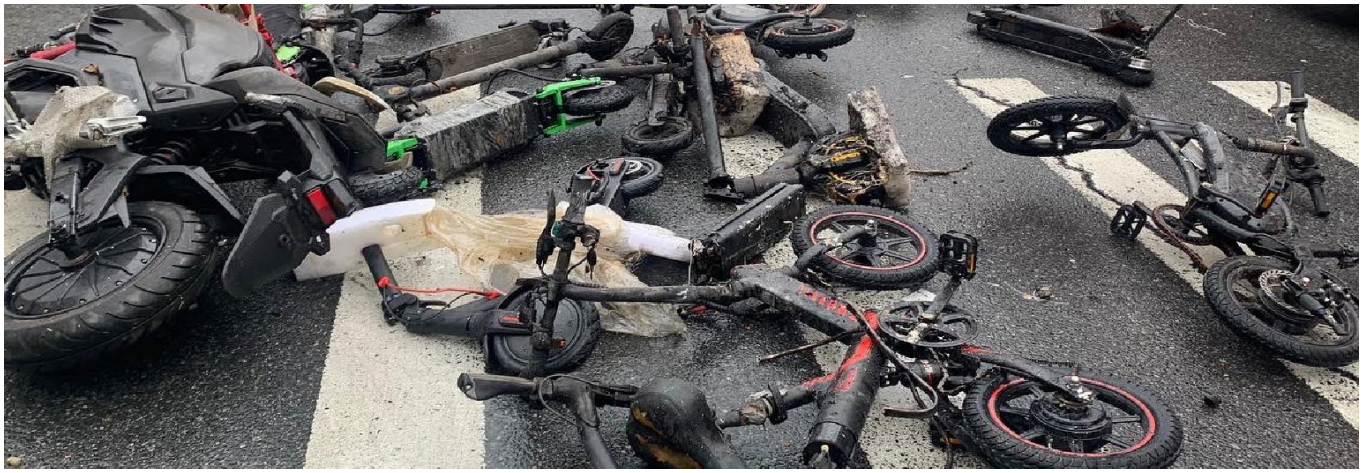
Fire Extinguishers
do not work
on lithium-ion batteries fires.

Unexpected Re-ignition.

Reignition is common. Lithium-Ion Batteries are known to unexpectedly re-ignite (without warning) minutes, hours and even days after all visible fire has been put out.

Lithium-ion batteries can enter an uncontrollable, self-heating state. This can result in the release of gas, cause fire and possible explosion.

These batteries may continue to generate heat even when there is no visible sign of fire. Once heat reaches a certain level fire may reignite on the battery and surrounding area.



17. APPENDIX

Complete form and print/save a copy for your records.

Press "Submit" to electronically file the form with FDNY or email a copy to districtofficeheadquarters@fdny.nyc.gov.

Carbon Dioxide Beverage Dispensing System Installer Certification of Installation, Alteration or Repair and Incident Reporting Form

Reset/Clear Form

Instructions: *FDNY Rule 3 RCNY Section 3004-01(b)(4) requires the filing of this form* ***for low-pressure systems storing more than 400 lbs. (3,946 SCF) of carbon dioxide.*** *This form must be completed by a carbon dioxide system installer holding a FDNY Certificate of Fitness for Carbon Dioxide Systems (G-82). Complete Sections 1, 2 and 5, and Section 3 and/or 4, as applicable. Attach additional sheets as needed.* ***Promptly email form to FDNY at Districtofficeheadquarters@fdny.nyc.gov. For information, contact FDNY District Office Headquarters, (718) 403-4079.***

Reason for Filing (*check all that apply*): ☐ **New Installation** ☐ **Alteration** ☐ **CO2 Incident Report/Repair**

SECTION 1. INSTALLER INFORMATION

Installer Name: _____ Certificate of Fitness No.: _____

Company Name: _____

Address: _____ City: _____ State: _____ Zip: _____

Email: _____ Telephone: _____

SECTION 2. PREMISES INFORMATION (CARBON DIOXIDE SYSTEM INSTALLATION)

Premises Address: _____ Borough: _____ Zip: _____

Name of Business: _____

Type of Business: _____

SECTION 3. NEW INSTALLATION/SYSTEM ALTERATION

Installation Date: _____ Location: (*floor and room/area*): _____

Total # of Storage Containers: _____ Description of Storage Containers (*complete table below*):

	Manufacturer	Model	Capacity (*indicate lbs or SCF*)	MAWP	Serial Number
1					
2					
3					
4					
5					
6					

CO_2 Detection and Alarm System Provided: ☐ Yes ☐ No Mechanical Ventilation In Storage Area: ☐ Yes ☐ No

Location(s) of CO_2 Sensor: _____

Locations of CO_2 Alert Devices: _____

Location of Central Unit Panel (*if any*): _____

SECTION 4. INCIDENT REPORTING/POST-INCIDENT REPAIR

Incident Date: _____ Time: _____ System Restoration Date: _____ Time: _____

CO_2 Release: Location (*floor and room/area*) _____ Severity: ☐ Low Level ☐ STEL ☐ PEL

Cause/Affected Component(s): _____

Repairs Made (*complete Section 3 if system or components replaced*): _____

_____

SECTION 5. INSTALLER CERTIFICATION

I hereby certify under the penalty of perjury that the above carbon dioxide beverage dispensing system was installed, altered and/or repaired as set forth above, in accordance with FDNY rule 3 RCNY 3004-01, International Fire Code Section 5307 and NFPA Standard 55, or (if installed before 10/1/2017) other applicable standard, and was in good working order at the time of the completion of such work.

INSTALLER SIGNATURE: _____ DATE: _____

CO2 Installer Certification (12/2017)

Submit