

**FIRE DEPARTMENT • CITY OF NEW YORK**



**STUDY MATERIAL FOR THE  
CERTIFICATE OF FITNESS EXAMINATION**

**G-98**

**STORAGE, HANDLING AND USE OF COMPRESSED FLAMMABLE  
GASES**

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## NOTICE OF EXAMINATION

**Title:**                **Examination for Certificate of Fitness for Handling, Use, and Storage of Flammable Compressed Gases (G-98).**

**Date of Exam:** Written exams are conducted Monday through Friday (except legal holidays) 8:00 AM to 2:30 PM.

**G-98** can be obtained by passing a written exam or qualifying for an exemption on the basis of education and experience.

### **REQUIREMENTS FOR WRITTEN EXAM**

Applicants who need to take the exam must apply in person and bring the following documents:

1. Applicants must be at least 18 years of age.
2. Applicants must have a reasonable understanding of the English language.
3. Applicant must provide two forms of identifications; at least one identification must be government issued photo identification, such as a State-issued Driver's License or Non Driver's License or a passport.
4. Applicants must present a letter of recommendation from his/her employer. The letter must be on official letterhead, and must state the applicant's full name, experience and the address where the applicant will work. If the applicants are self-employed or the principal of the company, they must submit a notarized letter attesting to their qualifications. For more info:  
[http://www.nyc.gov/html/fdny/html/c\\_of\\_f/cof\\_requirements.shtml](http://www.nyc.gov/html/fdny/html/c_of_f/cof_requirements.shtml)
5. Applicants must present a completed application for certificate of fitness (A-20 Form). <http://www.nyc.gov/html/fdny/pdf/a20.pdf>
6. Applicants not currently employed may take the exam without the recommendation letter. If the applicants pass the exam, FDNY will issue a temporary letter with picture for the job seeking purpose. The C of F card will not be issued unless the applicants are employed and provide the recommendation letter from his/her employer.

**7. APPLICATION FEE:**

Pay the **\$25** application fee in person by one of the following methods:

- Cash
- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)
- Personal or company check or money order (*made payable to the New York City Fire Department*)

For fee waivers submit: *(Only government employees who will use their C of F 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

A convenience fee of 2.49% will be applied to all credit card payments.

## **8. EXAM INFORMATION**

The **G-98** exam will consist of **50** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limit exam. A passing score of at least 70% is required in order to secure a Certificate of Fitness. Call (718) 999-1988 for additional information and forms.

### **Special material provided during the test:**

The following 2 materials will be provided to you as a reference material when you take the test at Metro Tech, however, the booklet will not be provided to you during the test.

1. Table on indoor storage limits
2. Table on distances of outdoor storage to flammable gases

Please always check for the latest revised booklet at FDNY website before you take the exam.

[http://www.nyc.gov/html/fdny/pdf/cof\\_study\\_material/g\\_98\\_st\\_mat.pdf](http://www.nyc.gov/html/fdny/pdf/cof_study_material/g_98_st_mat.pdf)

9. If all the requirements are met and pass the exam a certificate will be issued the same day. Applicant who fails the exam will receive a failure report. To retake the exam applicants will need to submit a new application and payment.

### **ALTERNATIVE ISSUANCE PROCEDURE (AIP)**

This certificate of fitness can be obtained by qualifying for an exemption from an exam on the basis of education and experience. Applicants who qualify for AIP must apply by mail. For more detail information applicants must review the **G-98** AIP information.

[http://www.nyc.gov/html/fdny/pdf/cof\\_study\\_material/g98\\_aip\\_info.pdf](http://www.nyc.gov/html/fdny/pdf/cof_study_material/g98_aip_info.pdf)

### **RENEWAL REQUIREMENTS**

This Certificate of Fitness must be renewed every **THREE YEARS**. The renewal fee is **\$15**. FDNY also reserves the right to require the applicants to take a re-examination upon submission of renewal applications.

You will receive a courtesy notice of renewal 90 days before the expiration date. However, it is your responsibility to renew your Certificate. It is very important to renew your C of F before it expires. Renewals submitted 90 days (up to one year) after the expiration date will incur a \$25 penalty in addition to the renewal fee. Certificates expired over one year past expiration date will not be renewed. New exams will be required.

**To change a mailing address:**

- Submit a letter requesting the change of mailing address and a copy of your C of F with \$5.00 fee.

**To change a work location,**

- Submit a letter from your current employer (on company letterhead) confirming that you are an employee and stating your new work location with a copy of your C of F and a \$5.00 fee

**To request a replacement certificate:**

- Submit a driver's license or passport, social security number, mailing address and a \$5.00 fee.

The certificate can be renewed **On-line, by Mail or in Person.**

• **Renewal online**

If you are an individual, make sure you have your 12 digit Certificate of Fitness Access ID. This can be found on your Renewal Notice. If you do not have your Renewal Notice, your Access ID is your 8 digit Certificate of Fitness number and the last four digits of your social security number. If you are submitting renewals on behalf of a company's employees, the company must be approved by FDNY and have an 8 digit Company Code. To request approval, email [pubrenew@fdny.nyc.gov](mailto:pubrenew@fdny.nyc.gov).

Renewal fee can be paid by one of the following methods:

- Credit card (American Express, Discover, MasterCard, or Visa)
- Debit card (MasterCard or Visa)
- E-check

A fee exempted applicants cannot renew online only by mail or in person.

If all the requirements are met, the certificate of fitness will be mailed out within 10 days.

For online renewal go to:

<https://paydirect.link2gov.com/FDNYCOF/ItemSearch>

• **Renewal by mail**

Mail your Renewal Notice (if you did not receive a Renewal Notice, a copy of your certificate), along with your fee payment

Personal or company check or money order (made payable to the NYC

Fire Department)

For fee waivers submit: ***(Only government employees who will use their C of F 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

and if applicable, supporting documents to:

**NYC Fire Department (FDNY)**

Cashier's Unit

9 MetroTech Center, 1st Floor

Brooklyn, NY 11201

If all the requirements are met, the certificate of fitness will be mailed out within four to six weeks.

• **Renewal in person**

Submit your Renewal Notice (or if you did not receive a Renewal Notice, a copy of your certificate), along with your fee payment by one of the following methods:

- Cash
- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)
- Personal or company check or money order (*made payable to the*

*New*

*York City Fire Department*)

For fee waivers submit: ***(Only government employees who will use their C of F 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

and if applicable, your supporting documents to:

**NYC Fire Department (FDNY)**

Cashier's Unit

9 MetroTech Center, 1st Floor

Brooklyn, NY 11201

If all the requirements are met, the certificate of fitness will be issued the same day.

**A convenience fee of 2.49% will be applied to all credit card payments for original or renewal certificates.**

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



## **STUDY MATERIAL AND TEST DESCRIPTION**

### **ABOUT THE STUDY MATERIAL**

This study material will help you prepare for the examination for the Certificate of Fitness for *Handling, Use, and Storage of Compressed Flammable Gas*. The study material includes information taken from the New York City Fire Code and New York City Fire Rules. The exam covers this entire study material and any reference tables. **Keep in mind that this study material will not be provided to you during the examination.** It is important that you read and understand this booklet to help you increase your chances of passing this test.

The study material does not contain all of the information you need to know to use, store and handle compressed flammable gases. It is your responsibility to become familiar with all the 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, 35, and 38, NFPA 55-Chapter 7 and CGA-P1+P18.

### **ABOUT THE TEST**

The G-98 Certificate of Fitness exam consists of **50** 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 on the examination 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 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 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
- 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.

**3. 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
- C. the examiner in the testing room
- D. you should not ask about test questions since FDNY staff can not 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.

## DEFINITIONS

**COMBUSTIBLE WASTE:** Any substance, item or other organic or inorganic matter that presents a fire hazard and is a byproduct or residue of the construction, use or occupancy of any premises, or any activity conducted thereon, that has no economic value in connection with such use or occupancy.

**COMPRESSED GAS:** A material, or mixture of materials that is a gas at 68F or less at 14.7 psia of pressure; and has a boiling point of 68F or less at 14.7 psia that is either liquefied, non-liquefied or in solution at that temperature and pressure, **except gases which have no other health-or physical-hazard properties that are not considered to be compressed until the pressure in the packaging exceeds 41 psia at 68F.** Compressed gases shall be classified as follows:

**Non-liquefied compressed gases:** Gases, other than those in solution, that are in a packaging under the charged pressure and are entirely gaseous at a temperature of 68F.

**Liquefied compressed gases:** Gases that, in a packaging under the charged pressure, are partially liquid at a temperature of 68F.

**Compressed gases in solution:** Non-liquefied gases that are dissolved in a solvent.

**Compressed gas mixtures:** A mixture of two or more compressed gases contained in a single packaging, the hazard properties of which are represented by the properties of the mixture as a whole.

**COMPRESSED GAS CONTAINER:** A pressure container designed to hold compressed gases at pressures greater than 1 atmosphere at 68F. A compressed gas container is a container that stores highly pressurized gas.

**COMPRESSED GAS SYSTEM:** An assembly of components, such as containers, reactors, pumps, compressors and connecting piping and tubing, designed to contain, distribute or transport compressed gases.

**CONTAINMENT SYSTEM:** A gas-tight recovery system comprised of devices or equipment which, when placed over or around the portion of the compressed gas container that is leaking, stops or controls the escape of gas from the container.

**CONTAINMENT VESSEL:** A gas-tight vessel which, when installed or placed over or around a leaking compressed gas container, confines the container and the gas leaking therefrom.

**DOTn:** United States Department of Transportation, n=US regulations, not Canadian.

**EXPLOSION:** An effect produced by the sudden violent expansion of gases, whether or not accompanied by a shock wave or disruption, of enclosing materials, including the effects of the following sources of explosion:

1. Chemical changes such as rapid oxidation, deflagration or detonation, decomposition of molecules and runaway polymerization (usually detonations).
2. Physical changes such as pressure tank ruptures.
3. Atomic changes (nuclear fission or fusion).

**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.

**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.

**EXHAUSTED ENCLOSURE:** A device, typically consisting of a hood equipped with a fan that serves to capture and exhaust fumes, mist, vapors and gases generated at a workstation or other local environment. An exhausted enclosure does not include a room provided with general ventilation.

**FIRE EXTINGUISHING SYSTEM:** An approved system of devices and equipment which detects a fire and discharges an approved fire extinguishing agent onto or in the area of a fire. Such term includes automatic systems and, where such systems are authorized by this NYC Fire Code or the NYC Building Code, manually activated systems.

**FLAMMABLE GAS:** A material which is a gas at 68°F or less at 14.7 pounds per square inch absolute (psia) of pressure which:

1. Is ignitable at 14.7 psia when in a mixture of 13 percent or less by volume with air, in accordance with testing procedures set forth in ASTM E 681; or
2. Has a flammable range at 14.7 psia with air of at least 12 percent, regardless of the lower limit, in accordance with testing procedures set forth in ASTM E 681.

**FLAMMABLE LIQUEFIED GAS:** A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 68°F and which is a flammable gas.

**FLAMMABLE LIMITS:** Flammability limits refer to the fact that mixtures of gaseous fuels and air will only burn if the fuel concentration lies within well defined limits. Limits are normally expressed in terms of volume percentage at 25 °C and atmospheric pressure, but are functions of temperature and pressure.

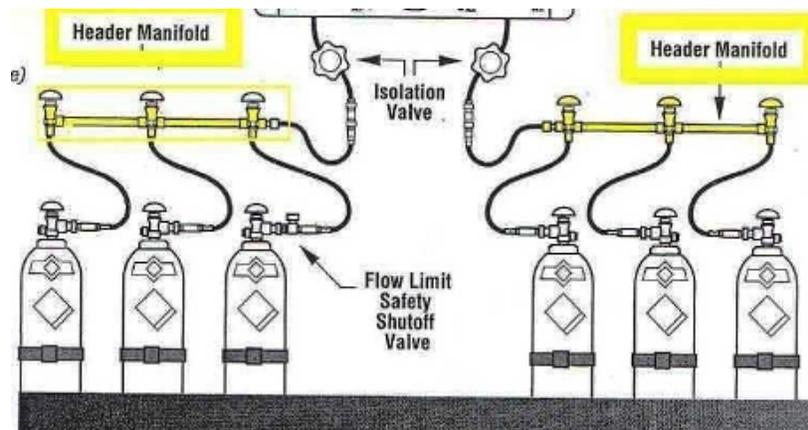
**GAS CABINET:** A fully enclosed, noncombustible enclosure used to provide an isolated environment for compressed gas containers in storage or use, including any doors and access ports for exchanging containers and accessing pressure-regulating controls.

**GAS ROOM:** A separately ventilated, fully enclosed room in which only compressed gases and associated equipment and supplies are stored or used.

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

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

**MANIFOLD:** Multiple tanks that are connected together to operate as one system.



**EXAMPLE OF A MANIFOLD**

**LOWER EXPLOSIVE LIMIT (LEL):** See “Lower flammable limit.”

**LOWER FLAMMABLE LIMIT (LFL):** The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as LEL or lower explosive limit.

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

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

**OXIDIZING GAS:** A gas that can support and accelerate combustion of other materials.

**PERSONAL SUPERVISION:** Supervision by the Certificate of Fitness holder, who is required to be personally present on the premises, or other proximate location acceptable to the NYC Fire Department, while performing the duties required.

**PIPE AND TUBE:** Pipes and tubes are used to transport liquid or gas.

**PSIA:** pounds per square inch, absolute. **PSIA** is used to make it clear that the pressure is relative to a vacuum rather than the ambient atmospheric pressure. Since atmospheric pressure at sea level is around 14.7 psi, this will be added to any pressure reading made in air at sea level.

**PSIG:** pound-force per square inch gauge is a unit of pressure relative to atmospheric pressure at sea level. Indicating that the pressure is relative to atmospheric pressure. For example a bicycle tire pumped up to 65 psi above atmospheric pressure, will have a pressure of  $65 + 14.7 = 79.7$  psia or 65 psig.

**UPPER EXPLOSIVE LIMIT (UEL):** Highest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). Concentrations higher than UFL or UEL are "too rich" to burn.

## INTRODUCTION

This booklet outlines New York City Fire Department regulations for the **safe use, handling** and **storage** of compressed flammable gases.

### **What is compressed flammable gas?**

It is any gas that is ignitable in a mixture of 13% or less (by volume) with air, or the flammable range with air is at least 12%, regardless of the lower limit, at atmospheric temperature and pressure.

### **Examples of FLAMMABLE GASES include:**

Acetylene  
Hydrogen  
Methane  
Methylamine  
Carbon Monoxide  
Hydrogen-Sulfide  
Vinyl chloride

### **This booklet incorporates the safety requirements of:**

- 1) G-14: Handling Hydrogen
- 2) G-20: Direct Hydrogen: Use Cool Generators
- 3) G-52: Storage and Use of Flammable/Combustible Gases
- 4) G-55: Ethylene Oxide/Sterilizers

**ABOVE CERTIFICATE OF FITNESS PERMITS ARE NO LONGER OFFERED.**

## **THIS BOOKLET DOES NOT COVER THE FOLLOWING:**

### **1) ANHYDROUS AMMONIA**

Anhydrous ammonia is classified by the Department of Transportation as nonflammable, however, the gas is flammable and can form explosive mixtures with air at 16–25% concentrations. It is unlikely that such concentrations will occur except in confined spaces or in the proximity of large spills.

The fire hazard from ammonia is increased by the presence of oil or other combustible materials. Repeated exposure to ammonia lowers the sensitivity to the smell of the gas: normally the odor is detectable at concentrations of less than 50 ppm, but desensitized individuals may not detect it even at concentrations of 100 ppm. Anhydrous ammonia corrodes copper and zinc-containing alloys, and so brass fittings should not be used for handling the gas.

**Applicants who need to take the Anhydrous Ammonia test should read the study material:**

Use of Anhydrous Ammonia for: Heat Treating (Dissociators) and Use of Anhydrous Ammonia with Duplicating Machines (G-99)

**2) LPG/CNG**

**Applicants who need to take LPG or CNG tests should read the study material:**

Use of LPG/CNG in Engine Fuel System (G-22)  
Use of LPG/CNG at Outdoors Events and Mobil Cooking (G-23)  
Use of LPG/CNG in Emergency Indoor Repair (G-24)  
Use of LPG/CNG in Hot-Air Balloon (G-34)  
Use of LPG/CNG in Manhole Operations (G-36)  
Use of LPG/CNG for Tar Kettles, Asphalt Melter and Marking Street Line (G-40)  
Storage and Handling of LPG/CNG (G-44)

**3) HOT-WORK (Torch)**

**Applicants who need to take Torch Certificate of Fitness tests should read the NEW study material:**

Torch Use of Flammable Gases for Hotwork Operations (G-60)  
Fire Guard for Torch Operations and Construction Sites (F-60)  
Torch Use in Manufacture of Jewelry (OLD G-95 and G-39) (NEW G-61)

**4) Sanitary Landfill Methane Gas Recovery Facilities**

**Applicants who need to take Methane Gas Recovery Certificate of Fitness should read the study material:**

Recovery of Methane Gas from Landfill (G-19)

\*Note that this Certificate of Fitness does not have a written test; however, issuance of the Certificate of Fitness will be based on an evaluation of applicants' qualifications, education, and experience.

## **CERTIFICATE OF FITNESS**

The storage, handling and use of compressed flammable gases shall be supervised by a person holding a G-98 Certificate of Fitness. This includes the dispensing of such gases.

The **handling and use** of compressed flammable gases in quantities requiring a permit shall be under the **personal supervision** of a person holding a G-98 Certificate of Fitness.

The **storage** of compressed flammable gases in quantities requiring a permit shall be under the **general supervision** of a person holding a G-98 Certificate of Fitness.

### **REFILLING OF COMPRESSED FLAMMABLE GAS CONTAINERS IS STRICTLY PROHIBITED IN NYC.**

The G-98 Certificate of Fitness holders are RESPONSIBLE for ensuring that **ALL** New York City Fire Department regulations related to the safe use, handling and storage of flammable compressed gases are obeyed on the premises at all times. The failure of G-98 holders to fulfill their duties can result in having their Certificate of Fitness revoked. Upon receiving their Certificate of Fitness, G-98 holders must maintain their Certificate of Fitness for their entire term of employment.

## **PRE-EXISTING AND NEW INSTALLATIONS**

In July of 2008, a new Fire Code was adopted in New York City. Unlike the former code, this new code set forth specific regulations regarding the storage, use, and handling of flammable gases. Flammable gas storage area plans shall be approved by the FDNY.

You will see references and requirements that are applicable to “pre-existing” installations in this study material. It is important that you understand what this entails. All installations approved by the NYC Fire Department (FDNY) on or after July 1, 2008 are required to be in full compliance with the 2008 Fire Code; however, installations approved by the NYC Fire Department prior to July 1, 2008 are not required to comply, and in some cases could not comply with the design and installation requirements of the 2008 Fire Code. Such installations are considered to be “pre-existing”, and as such are only required to comply with the design and installation requirements in effect at the time the installation was established. Installations that were in existence prior to July 1, 2008, but operating without a FDNY permit, may also be considered “pre-existing” installations provided they were in compliance with nationally recognized standards and the NYC Building Code at that time.

It is of the highest importance to understand that all installations are required to comply with the operational and maintenance requirements of the 2008 Fire Code. Operational and maintenance requirements include such things as securing permits and certificates of fitness, posting signage, proper housekeeping, periodic testing, periodic maintenance, keeping logs and providing portable fire extinguishers.

Flammable gas storage area plans must be filed with NYC Department of Buildings.

More often than not, “pre-existing” installations will be storing flammable compressed gases in quantities exceeding those that are allowed by the new code. For “pre-existing” installations that have been operating with a valid FDNY permit, the maximum allowable quantity of flammable compressed gases would be established by that permit; however, for “pre-existing” installations that have been operating without a FDNY permit, the burden of proof is on the owner to provide the FDNY with records establishing their need for those flammable compressed gases in the quantities stored. Records acceptable to the FDNY include true copies of the annual inventory forms filed with the City of New York as required by New York State General Municipal Law Section 209-u and/or the annual facility inventory forms filed with the NYC DEP (Tier II) as required by the NYC Right to Know Law. The forms would then be reviewed and a determination made accordingly.

For the most part, permits issued for installations established prior to July 1, 2008 are subject to compliance with the former code requirements while those issued for installations established after July 1, 2008 are subject to compliance with the new fire code. It is, therefore, possible that there could be two different installations in the same building, covered by separate permits, both supervised by the same Certificate of Fitness holder. The Certificate of Fitness holder will have the responsibility of distinguishing and ensuring compliance with the different code requirements.

## TYPES OF PERMITS

### (1) SITE-SPECIFIC PERMIT

Such permit authorizes the permit holder to store, handle and use flammable compressed gases at a specific premises or location. A site-specific permit may be a permanent permit or a temporary permit. Permanent permits (premises related permits) are valid for 12 months only. Every permit or renewal shall require an inspection and shall expire after twelve months. Temporary permits may be valid from 1 day to 12 months depending on the construction/operation needed. For example, a 3-month temporary permit may be issued to a construction site.

\*The **storage, handling and use** of compressed flammable gas above **400 SCF** (standard cubic feet) requires a permit.

### AN EXAMPLE OF FDNY PREMISES PERMIT

FIRE DEPARTMENT, CITY OF NEW YORK				BUREAU OF FIRE PREVENTION									
ACCOUNT NUMBER 77777777	TYPE 10	A.P. P	D.O. 12	ADM. CO. E284	ISSUANCE DATE 01/28/10	PERMIT EXPIRES 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	09	01	COMPRESSED FLAMMABLE GASES	1	PAID								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">PERMIT TYPE 1</td> <td style="width: 50%;">ANNUAL FEE PAID</td> </tr> </table>				PERMIT TYPE 1	ANNUAL FEE PAID	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">1=REGULAR</td> <td style="width: 50%;">CARI &amp; RENO</td> </tr> <tr> <td>2=SUPPLEMENTAL</td> <td>1111 YORK ST</td> </tr> <tr> <td>3=DUPLICATE</td> <td>STATEN ISLAND NY 11111</td> </tr> </table>		1=REGULAR	CARI & RENO	2=SUPPLEMENTAL	1111 YORK ST	3=DUPLICATE	STATEN ISLAND NY 11111
PERMIT TYPE 1	ANNUAL FEE PAID												
1=REGULAR	CARI & RENO												
2=SUPPLEMENTAL	1111 YORK ST												
3=DUPLICATE	STATEN ISLAND NY 11111												
 2011012938				BY ORDER OF THE COMMISSIONER									

## AN EXAMPLE OF FDNY TEMPORARY PERMIT

D.O.	COMPANY	BORO	ACCOUNT NO.	TOTAL FEE	
01		MANH	3333333	\$ 525.00	022411

Expiration Date	11/01/11	<b>THE CITY OF NEW YORK FIRE DEPARTMENT</b> Bureau of Fire Prevention 9 Metro Tech Center Brooklyn, N.Y. 11201-3857	PERMIT COVERS CODE NO.
	F 02872	<b>FIRE DEPARTMENT PERMIT</b> Postal Address of Permit Holder or Agent: KARLIN PIPING INDUST 347 9TH AVE WASHINGTON, N.Y. 11792	345 OXYGEN STORAGE AT A CONSTRUCTION SITE 346 ACETYLENE STORAGE AT A CONSTRUCTION SITE 347 USE OXYGEN AND ACETYLENE TORCH AT A CONSTRUCTION SITE NOTE: OXYGEN AND ACETYLENE CYLINDERS SEPARATELY STORED IN APPROVED CAGES AT GROUND LEVEL
		Occupancy for which this Permit is issued and at which it must be displayed: 13110 WEST 11 STREET NEW YORK, N.Y., 10011	
		New York <u>MANHATTAN</u> <small>Pursuant to the provisions of the administration Code and the regulations made thereunder, the above permittee is hereby authorized by the Fire Commissioner to store and use HAZARDOUS MATERIALS in the quantity specified.          This permit is revocable at the pleasure of the Commissioner, and is issued with the express understanding that the articles herein named are to be stored and kept in accordance with the provisions of the law; that the permittee will use all possible care to avoid accidents; that it is only available for the location and permittee named.</small> <div style="text-align: right;">             Fire Commissioner         </div>	

RF-101 (1/01) 93-111-R25-0470

CASHIER'S COPY

### (2) CITYWIDE PERMIT

Such permit authorizes the permit holder to store, handle, use, or transport flammable compressed gases, or conduct an operation on a citywide basis, for which a permit is required by the Fire Department. A citywide permit is valid to conduct an operation at one or more locations provided the duration of such activity at any individual location does not exceed 30 days. Periods of activity in excess of 30 days at any one location shall require a site-specific permit.

**\*OVERNIGHT STORAGE IS NOT ALLOWED WITH A CITYWIDE PERMIT. It is permissible to bring the compressed flammable gas containers in the morning and store them during the day; however, compressed flammable gas containers must not be left stored at night.**

Permits are not transferable and any change in occupancy, operation, tenancy or ownership must require that a new permit be issued. The Certificate of Fitness holder is responsible for ensuring that all fire safety regulations and procedures regarding the premises are obeyed. Permits and Certificates of Fitness shall be readily available on the premises for inspection by Fire Department representatives.

## FLAMMABLE GASES REPORTING

The storage of flammable gases shall be reported as required by the New York State General Municipal Law Section 209-u. The knowledge of the presence of flammable materials is vital to meeting the contingencies of a fire or other emergency. It is the purpose of this section to secure the health, safety and welfare of the public, protect those called upon to respond to the emergency, encourage preparedness to meet any danger, and promote planning concerning emergency services by requiring the reporting of the presence of flammable materials.

### Material Safety Data Sheets (MSDS)

Material Safety Data Sheet (MSDS) information must be readily available. The material safety data sheet (MSDS) 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 should be followed in case of an emergency. For example, the MSDS may list appropriate and inappropriate extinguishing agents. The Certificate of Fitness holder must refer to the MSDS when questions arise about how to handle, use, or store

hazardous materials. The MSDS may also be requested by health care personnel to facilitate proper medical care in the event of exposure.

### HAZARD IDENTIFICATION SIGNS: NFPA 704 DIAMOND SIGN

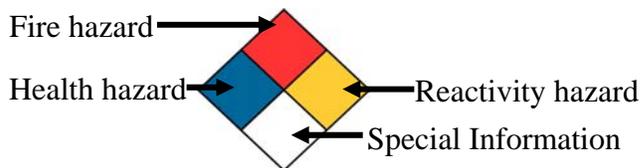
*Storage, handling and use* of compressed flammable gases is accompanied in the NYC Fire Code by a requirement for the use of consistent signage to alert people, including first responders, to the presence of flammable materials in a facility. The intent of the signage is to provide an indication of the relative degree of harm that the material may pose. In general, the NFPA 704 sign system is used for storage of the flammable materials on the premises. This simple system uses symbols, colors and numbers to readily communicate these concerns in a visual manner, and recognizes the fact that a material may pose more than one type of hazard. Unless otherwise exempted by the commissioner, hazard identification signs as set forth in NFPA 704 for the specific material contained shall be conspicuously affixed on stationary containers and aboveground tanks and at entrances to locations where flammable gases are stored, handled or used, including dispensing, in quantities requiring a permit, as well as at such other locations as may be designated by the Fire Commissioner.

NFPA Rating Explanation Guide					
RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD	RATING SYMBOL	SPECIAL HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures	ALK	Alkaline
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock	ACID	Acidic
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	COR	Corrosive
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable	OX	Oxidizing
0	No hazard	Will not burn	Stable	☢	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

NFPA-Chart\_1 www.ComplianceSigns.com

The basis of the system is a diamond-shaped sign that is divided into four color-coded quadrants (see left figure below). The left-most quadrant is colored blue and represents the *health* hazard posed by the material, it is often referred to as the nine o'clock quadrant. The upper quadrant is red in color and indicates the relative *fire* hazard. The right-most quadrant is yellow and conveys the relative potential for *reactivity* of the material. 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.



**Blank NFPA Diamond Sign**

**Sign with Hazards Indicated**

The diamond-shaped sign is required by the Fire Code to be conspicuously displayed at the entrance to locations where flammable materials are stored, handled and used, and on stationary containers and aboveground tanks containing flammable materials. Note that the sign requirement also applies to locations at which a flammable material is dispensed. The triggering amount for the sign requirement is the amount required for a permit.

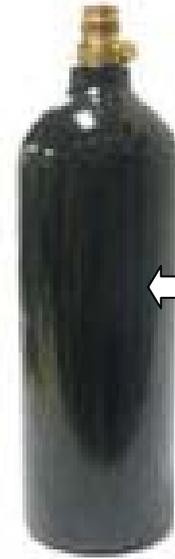
The numbering system that is used to convey the hazards of a material uses a scale of 0 through 4 for each of the three hazard types (health, flammability and instability). A number is placed in each box, specific to the material at hand. In each quadrant, a “0” represents the least degree of hazard 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 (see right figure on the previous page). Intermediate numbers represent increasing levels of hazard in all categories, such as the “3” that is present in the “health” quadrant at nine o’clock in the figure above. This is indicative of a material that can cause permanent or serious injury upon exposure.

## GENERAL REQUIREMENTS OF COMPRESSED GAS

### CONTAINERS

Compressed gas containers shall be designed and fabricated in accordance with the specifications of the ASME Boiler and Pressure Vessel Code or DOTn regulations that can be found in the Compressed Gas Association pamphlet. Compressed gas containers that are not designed for refillable use shall not be refilled after use of the original contents. **Partially full** compressed gas containers containing residual gases shall be considered as **full** for the purposes of the controls required. Areas used for the storage, handling and use of compressed gas containers and systems shall be provided with approved lighting by natural or artificial means. Compressed gas containers are designed to vent into atmosphere when the pressure inside the tank approaches dangerous levels. Portable compressed gas containers shall be marked in accordance with CGA pamphlet C-7 and DOTn regulations.



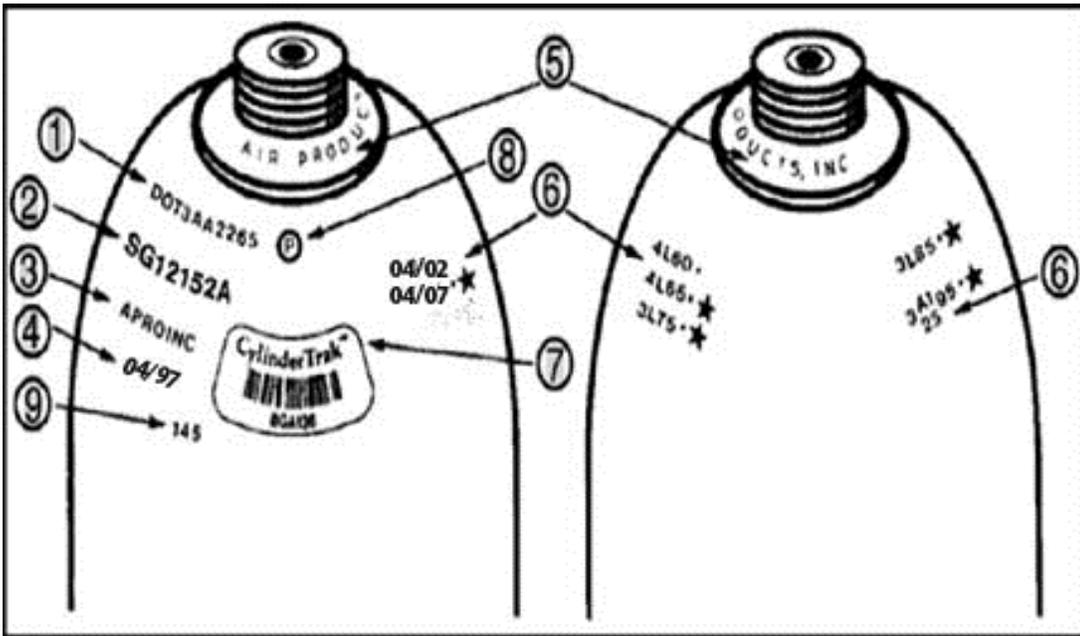
← **Example of a Gas Container**

### MARKINGS AND SIGNS

Individual containers, cartons or packages shall be conspicuously marked or labeled in an approved manner. Signs reading “COMPRESSED GAS” shall be conspicuously posted at the entrance to rooms or on cabinets containing compressed gases. Labels shall be visible from any direction of approach. All uninsulated stationary outdoor compressed gas containers shall be of light-reflective design or painted with a light-reflecting color. Gas identification should be stenciled or stamped on the container or a label, and is typically applied near the neck of the container. **Do not rely solely on the color of the container to identify the contents.** Do not use any container that is unmarked or has conflicting marking or labels. Signs and markings shall not be obscured or removed, and shall be written in English. Containers shall be durable, and the size, color and lettering shall be acceptable to the Fire Commissioner.

- Out-of-service compressed gas containers shall be marked to indicate that they are no longer available for service.
- If contents of a container cannot be identified, return the container to the supplier immediately.

## CONTAINER LABELING



1. DOT - Department of Transportation, which is the regulatory body that governs the use of containers.

- Specification of the container type of material of construction (e.g., 3AA).

- Service or working pressure in pounds per square inch.

2. Container serial number - ex. SG12152A. The letters SG precede the serial numbers for Specialty Gas containers.

3. Registered Owner Symbol: Symbol used to indicate the original owner of the containers.

- APROINC is a Registered Owner Symbol for Air Products.

4. Date of Manufacture, also the date of maintenance to indicate the original hydrostatic test (month/year).

5. Current owner of the container will appear on the neck ring.

6. Retest markings (month, facility, year, rating, stamp). A "+" indicates the container qualified for a 10 percent overfill. A star stamp on the end of the marking indicates the container meets the requirements for a 10-year retest.

**Month and the day when the container was tested.**



7. ContainerTrak bar code provides a unique identifier and is used by computer systems to track containers through the filling process. The bar code might be different company.

8. Container supplier's inspection marking, which is unique to the inspector.

9. Container tare weight, i.e. the weight of the container plus the valve without product, preceded by the letters "TW".

**ALL OF THESE ARE DOT REQUIREMENT LABELS. WHEN IDENTIFYING THE GAS ALWAYS LOOK AT THE LABELING AND NOT THE COLOR OF THE CONTAINER.**

## CONTAINER RELATED EQUIPMENT

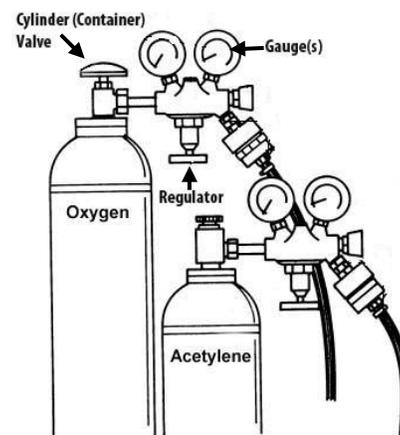
### 1. CONTAINER VALVE

A control valve is located on the top of each gas container. This valve can be opened or closed to control the discharge of the contents of the gas container. A handle is turned to open most gas control valves. **The container valve must be opened by hand.** Container valves shall be closed before moving a container, when work is completed, and when the container is empty.

If there is a weak point on a compressed gas container, it is the valve stem. If the valve stem should be struck or damaged, the gases under high pressure will escape at speeds up to 30,000 mph! It's this rapid release that turns the container into an unguided missile. Valves are generally made of brass, but may also be chrome-plated for medical gases, made of aluminum for disposable containers, or made of stainless steel for toxic, poisonous, phroforic, and corrosive gases.

### 2. REGULATOR

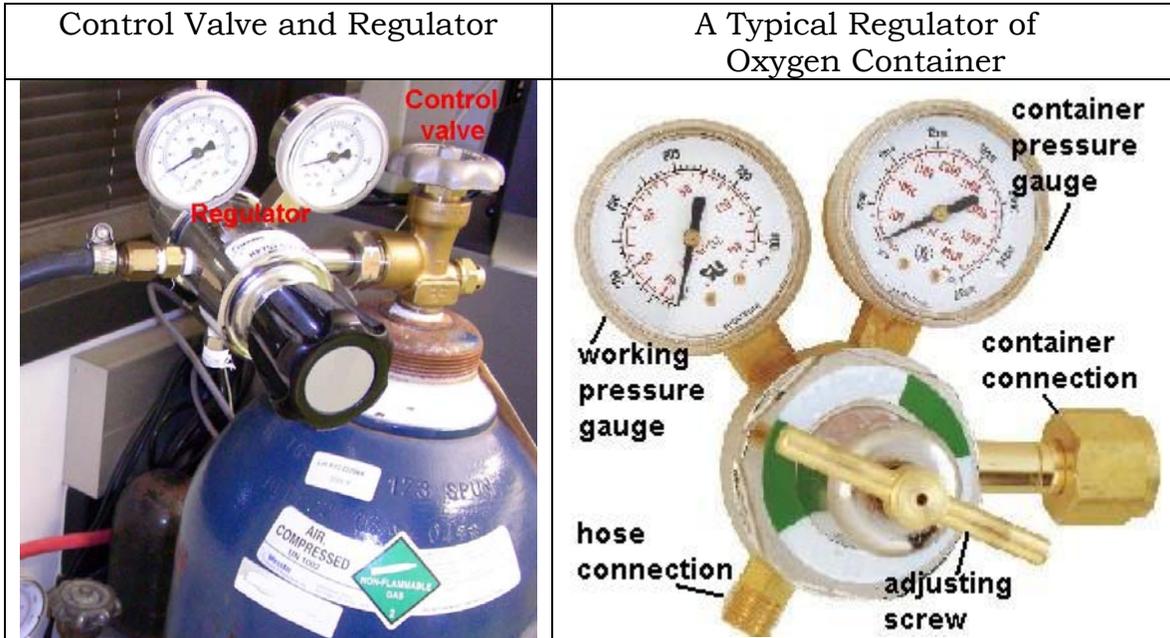
Before the gas containers can be used, a regulator must be attached to each of the control valves. A regulator is one of the most important parts of a compressed gas system. Regulators are designed to control pressure. They do not measure or control flow, unless equipped with devices such as a flow meter specifically designed for such purposes.



Always select the regulators recommended by the industrial gas supplier. **Do not** interchange regulators between different sizes/types of containers without consulting with the supplier. **Do not** open the gas container valve or regulator tap until the regulator is securely attached. Regulator connections to container valves must be completely free of dirt, dust, oil, and grease. Therefore the first action that must be performed

when connecting a regulator to a flammable gas container is to open the container valve for a moment to remove any dirt in the valve.

**\*When transporting the container the regulator must be taken off and the container must be capped.**



If there is a problem, the regulator may explode frontward and/or backward. The safest place to be standing is always to the side of the container valve. With the valve between you and the regulator if possible. This is to avoid reaching in front of the regulator face to open the valve.

**Opening a Regulator** - Stand on the valve side of the container at arms length so you do not have to reach in front of the regulator face. Turn your head away from the regulator and open the valve, turning counter clockwise, to blow out dust and debris, and then reclose the valve.

**Changing a Regulator** - Close the valve and drain the regulator by backing out the adjusting screw. Disconnect the regulator while not touching the nut and gland areas. Connect the regulator to the new container.

**Closing a Regulator** - Turn the valve clockwise to close the valve. Drain the regulator by turning (opening) the adjusting screw to release any gas.



### **3. PRESSURE-RELIEF DEVICES**

Compressed gas containers shall have a pressure relief device installed to prevent the rupture of a normally pressurized container when inadvertently exposed to fire or high temperatures. Pressure-relief devices shall have the capacity to prevent the maximum design pressure of the container or system from being exceeded. Pressure-relief devices shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container, adjacent structures, or personnel. This requirement shall not apply to DOTn specification containers having an internal volume of 2.0 SCF or less. Pressure-relief devices or vent piping shall be designed or located so that moisture cannot collect and freeze in a manner that would interfere with operation of the device.

\*Pressure relief valves on flammable gas containers shall never be adjusted as it occurs automatically upon operation.

### **4. HOSES**

In addition to being connected to a container the regulator is also connected to a hose that supplies the gas to the appliance. To reduce the likelihood of damage the hose must be as short as possible. When the gas containers are used inside the buildings, the hose must not pass through any partitions, walls, ceilings or floors.

- Hoses showing any kind of defects, including burns or signs of wear, shall be rendered unsuitable for service and shall be replaced.
- Examine hoses regularly for leaks.
- Keep hoses free from kinks and away from high traffic areas.
- Repair leaks promptly and properly.
- Store hoses in a cool place, and protect them from hot objects, and sparks.
- Do not use a single hose having more than one gas passage.

Hoses, pressure regulators, valves and other apparatuses/devices shall be kept gas tight to prevent leakage. Valves utilized on compressed gas systems shall be designed and manufactured from materials compatible with the material to be contained and shall be of adequate strength and durability to withstand the pressure, structural and seismic stress, and exposure to which they are subjected.

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.

Emergency shutoff valves shall be clearly visible and readily accessible. A durable sign shall be posted adjacent to valves that identifies their location.

A check valve is designed to prevent the reverse flow of a flammable gas into the hose and regulator of another gas.

**Exceptions:**

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

**CONTAINER PROTECTION**

Compressed gas containers and systems shall be secured and protected against physical damage and tampering. 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 shall be stored out of direct sunlight and away from sources of heat and ignition; temperatures must not exceed 125 F. 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 accumulation of ice and snow on the valves of containers connected for use.

The stacking of containers one on top of the other is prohibited, as well as placing containers inside a vehicle to protect them from extreme temperatures.

**SECURING CONTAINERS**

Compressed gas containers shall be secured to prevent movement from contact, vibration or seismic activity, utilizing one or more of the following methods:

- Securing containers to a fixed object with one or more noncombustible restraints. Containers shall not be secured to plumbing systems or electrical conduits.
- Securing containers on a cart or other mobile device designed for the movement of compressed gas containers.
- Nesting of compressed gas containers at container filling or servicing facilities or in a seller's warehouses NOT ACCESSIBLE TO THE PUBLIC. Nesting shall be allowed provided the nested containers, if

dislodged, do not obstruct any required means of egress. Where nesting is allowed, flammable gas containers within a group shall have a minimum of 3 points of contact with other containers, walls or bracing.

- Securing of compressed gas containers to or within a rack, framework, cabinet or similar assembly designed for such use, except when the containers are in the process of examination, filling, transport or servicing.
- Securing stationary compressed gas containers with a metal chain to a foundation designed for such use in accordance with the construction codes, including the NYC Building Code.

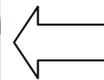


**EXAMPLE OF PROPERLY NESTED CONTAINERS**

**INCORRECT WAY TO CHAIN A CONTAINER**



**CHAIN(S) MUST BE TIGHT, NOT LOOSE.**



### **VALVE PROTECTION**

Compressed gas containers designed to be fitted with protective caps, collars or other protective devices shall have such caps or devices in place, except when the containers are in use. Compressed gas containers valves that are designed to accept protection caps or other protective devices shall have such caps or devices attached whenever the container is being stored or transported. Outlet caps or plugs shall be in place except when the compressed gas containers are in use or are being serviced or filled. **Keep container valve closed at all times**, except when the container is in active use.

## REGULAR INSPECTION

The Certificate of Fitness holder must regularly inspect the compressed gas containers, connections and appliances for leaks. The damaged containers must be removed from service.

### Items for quick visual check:

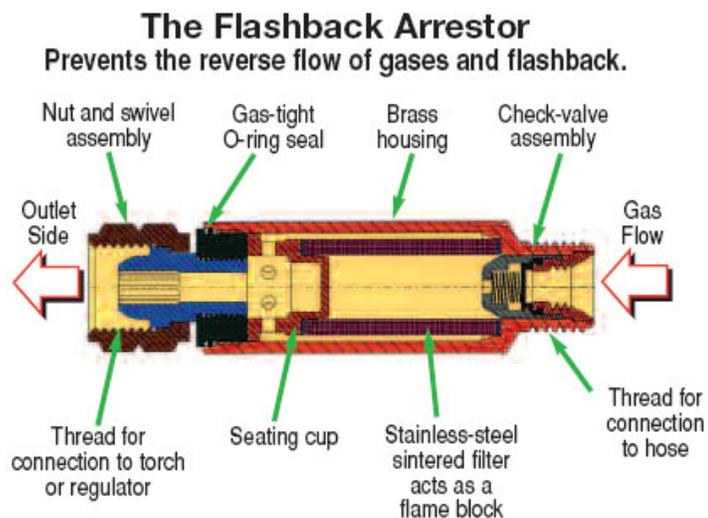
- No extreme denting, gouging, burn marks, or corrosion on the compressed gas container.
- The container protective cap/collar and the foot ring (where applicable) are intact and firmly attached.
- The container is painted or coated to minimize corrosion.
- No damage is visible on the pressure relief valve or obstruction to discharge.
- There is no leakage from the compressed gas container.
- Some gases emit a smell.
- The container is installed on a firm foundation and is not in contact with the soil.
- The containers are properly labeled.

Notify the permit holder if any condition has occurred which might allow any foreign substance to enter the gas container or valve. No service, repair, modification or removal of valves, pressure-relief devices or other compressed gas container appliances are allowed to be performed by unauthorized personnel. Leaking, damaged or corroded compressed gas containers shall be removed from service under the personal supervision of a G-98 Certificate of Fitness holder.

## FLASHBACK ARRESTER

Flashback arrestors are designed to stop a flashback from going beyond the point where they are installed. Flashback is the combustion of a flame mixture that can occur within your gas management system.

This can travel back through the line of your gas management system to you gas source if a flash back arrestors is not in line. A flash back arrestor shuts off gas flow and extinguishes the flame before it can reach your gas source.



## STORAGE OF COMPRESSED FLAMMABLE GAS

### REQUIRED SIGNS

The storage areas of compressed gas containers shall have prominently posted signs. Where gases of different types are stored at the same location, compressed gas containers should be grouped by types of gas, and the groups arranged to take into account the gases contained, e.g. flammable gases must not be stored near oxidizing gases.

Unless otherwise exempted by the Fire Department, hazard identification signs as set forth in NFPA 704 for compressed gas shall be conspicuously affixed **at entrances** to locations where the containers in quantities requiring a permit are stored, handled or used. Individual containers, cartons or packages shall be conspicuously marked or labeled in an approved manner.

Signs reading “**COMPRESSED GAS**” shall be posted at the entrance to rooms or on cabinets containing compressed gases.



All signs and markings required by the Fire Department must not be obscured or removed, must be in English or in symbols allowed by the Fire Department. They shall be durable, and the size, color and lettering must be acceptable to the Fire Department. Do not repaint gas containers.

### EMPTY CONTAINERS

**Charged and empty containers should be stored separately.** The removal of old containers must be planned so as to minimize the handling of the others.

### CONTAINER POSITION

Compressed gas containers, except those designed for use in a horizontal position, and all compressed gas containers containing non-liquefied gases, shall be stored in an **upright position** with the valve end up.

**Exception:** Compressed gas containers with an internal volume less than **0.174 SCF** may be stored in a horizontal position.

## **EXHAUSTED ENCLOSURES AND GAS CABINETS**

Indoor storage shall be provided with mechanical exhaust ventilation or natural ventilation in accordance with NYC Fire Code. Where gases are used having a hazard ranking of 3 or 4, as defined in NFPA 704, mechanical exhaust ventilation shall be provided to capture fumes, mists or vapors at the point of generation, except for the gases that do not generate harmful fumes, mists or vapors. When mechanical ventilation is provided, the systems shall be operational during such time as the building or space is occupied. Flammable gas containers shall be separated from oxygen container in the storage enclosures.

Where an exhausted enclosure is used to increase maximum allowable quantity per control area, or when the location of flammable materials in exhausted, enclosures are provided to comply with the FDNY requirements. The exhausted enclosures shall be in accordance with the following regulations:

- Exhausted enclosures shall be of noncombustible construction.
- The ventilation system for exhausted enclosures shall be designed to operate at a negative pressure relative to the surrounding area. The ventilation system shall be installed in accordance with the construction codes, including the Mechanical Code.
- Exhausted enclosures where flammable materials are used shall be protected by a built-in fire extinguishing system.

Where a gas cabinet is used to increase the maximum allowable quantity per control area or when the location of compressed gases in gas cabinets is provided to comply with the FDNY requirements, the gas cabinet shall be in accordance with the following regulations:

- The number of containers stored in a single gas cabinet shall not exceed **three**.
- Gas cabinets shall be constructed of not less than 0.097-inch steel; provided with self-closing limited access ports or noncombustible windows to give access to equipment controls; and have all interior surfaces treated, coated or constructed of materials that are compatible with the flammable materials stored.

## **VENTILATION SYSTEM**

The ventilation system for gas cabinets shall be designed to operate at a negative pressure relative to the surrounding area. The ventilation system shall be installed in accordance with the construction codes, including the Mechanical Code.

## SEPARATION FROM FLAMMABLE CONDITIONS

Compressed gas containers and systems in storage or use shall be separated from materials and conditions that present potential hazards, or to which they present potential hazards.

## INCOMPATIBLE MATERIALS

Incompatible compressed gas containers shall be separated from other incompatible materials.

Incompatible gases, shall be separated while in storage except for stored materials in individual containers each having a capacity of not more than **5 pounds**. Separation shall be accomplished by:

- Segregating incompatible materials in storage by a distance of not less than **20 feet**.

or

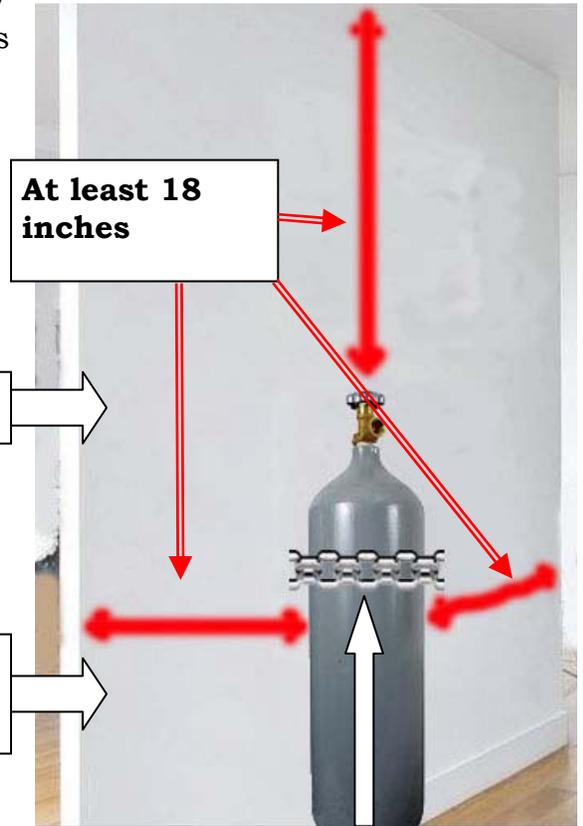
- Isolating incompatible materials in storage by a noncombustible partition extending not less than **18 inches above** and to the sides of the stored material.

or

- Storing compressed gases in gas cabinets or exhausted enclosures in accordance with the Fire Code. **Materials that are incompatible shall not be stored within the same cabinet or exhausted enclosure.**

**FIRE RATED WALL**

**NON COMBUSTIBLE PARTITION**



**THE CONTAINER MUST BE CHAINED TIGHTLY!**

## **FALLING OBJECTS**

Compressed gas containers and systems **SHALL NOT** be placed in areas where they are exposed to damage from falling objects.

Compressed Flammable gas containers should be placed at least:

- **20 feet** from all classes of flammable and combustible liquids, oxidizing gases and readily combustible materials, such as paper and combustible fibers.
- **25 feet** from open flames, ordinary electrical equipment or other sources of ignition.
- **50 feet** from air-conditioning equipment, air compressors and intakes of ventilation.
- **50 feet** from another indoor approved flammable gas storage location. (Assuming there is no fire separating wall.)

## **COMBUSTIBLE WASTE AND VEGETATION**

Do not store compressed gas containers near flammable or combustible substances such as oil, gasoline or waste. **Combustible waste and vegetation shall be kept a minimum of 10 feet from compressed gas containers and systems (in outdoor storage).** A noncombustible partition, without openings or penetrations extending not less than 18 inches above the height of the tallest container or system piping and not less than 18 inches to the sides of the storage area is allowed. The wall shall either be an independent structure, or the exterior wall of the building adjacent to the storage area.

## **LEDGES, PLATFORMS AND ELEVATORS**

Compressed gas containers **SHALL NOT** be placed near elevators, unprotected platform ledges or other areas where the container could drop a distance exceeding **one-half the height of the container.**

## **HEATING AND TEMPERATURE EXTREMES**

Compressed gas containers shall not be heated by devices that could raise the surface temperature of the container to above 125°F. Heating devices shall comply with the requirements of the Mechanical Code and the Electrical Code. Approved heating methods not capable of producing surface temperatures above 125° F are allowed to be used by trained personnel. Devices designed to maintain individual compressed gas containers at a constant temperature shall be approved and shall be designed to be fail-safe.

Compressed gas containers, whether full or partially full, shall not be exposed to temperatures exceeding 125° F or below the mean low atmospheric temperatures unless designed for use under the exposed conditions.

**EXPOSURE TO CHEMICALS**

Compressed gas containers and systems shall not be exposed to salt or corrosive chemicals or fumes that could damage containers, valves or valve-protective caps.

**WIRING AND EQUIPMENT**

Compressed gas containers and systems shall not be located where they could become part of an electrical circuit. Compressed gas containers and systems shall not be used for electrical grounding.

**EMPTY CONTAINERS AND RETURN TO SERVICE**

Before removing empty compressed gas containers from service close the valve and ensure that the plugs and the protective caps, if used, are replaced.

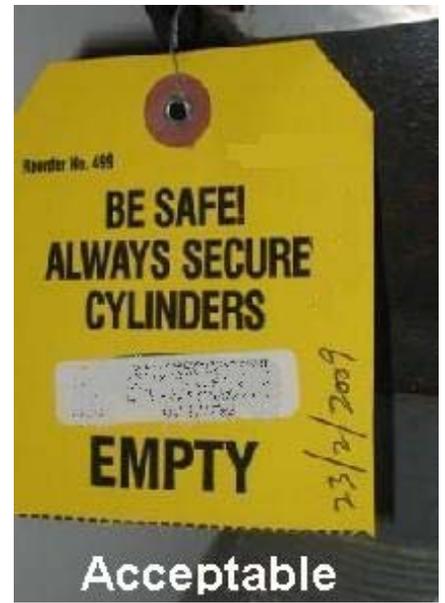
**GAS CONTAINER TAG**

The empty containers should be labeled or tagged with the word **“empty”** or the abbreviation **“MT”** and the date **and/or** moved to an area that is designated for empty containers. Always handle empty containers as carefully as full ones. Residual pressure can be dangerous.

Container before use

Container in service

Empty container



**EXAMPLES**

## **HANDLING AND USE OF COMPRESSED FLAMMABLE GAS**

### **COMPRESSED GAS SYSTEMS**

Compressed gas systems shall be suitable for their intended use and shall be designed and installed by persons competent in such design and installation. Compressed gas devices and systems shall be listed or approved. Compressed gas system controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls shall be designed to be fail-safe.

Venting of gases shall be directed to an approved location. Venting shall comply with the requirements of the Mechanical Code.

### **UPRIGHT USE**

Compressed gas containers, except those designed for use in a horizontal position, and all compressed gas containers containing non-liquefied gases, shall be used in an **upright position with the valve end up**. The axis of a container being used in an upright position may be inclined as much as 45 degrees from the vertical provided that it is properly secured. Use of flammable liquefied gases in the inverted position when the compressed gas is in the liquid state shall be allowed provided that the container is properly secured and the dispensing apparatus is designed for such liquefied gas use.

**Exception:** Compressed gas containers with an internal volume less than **0.174 SCF** may be used in a horizontal position.

### **TRANSFER OF PRODUCT**

The practice of transferring compressed gases from large to small containers by anyone other than the supplier or distributor is NOT ALLOWED,

Mixing of compressed gases in containers shall be prohibited. Transfer of any gases from one container to another in patient care areas of health care facilities shall be prohibited.

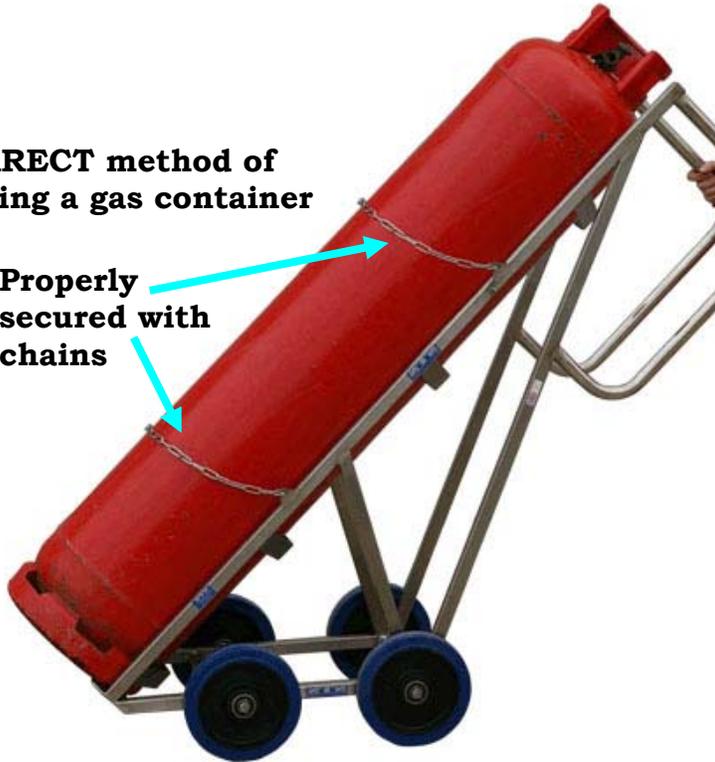
Compressed gas containers must not contain gases capable of combining chemically, nor should the gas service be changed by other than the manufacturer or distributor.

### **MOVING CONTAINERS**

Where removable caps are provided for valve protection, such caps should be kept on containers at all times except when containers are in use. Do not lift containers by the cap.

**CORRECT method of moving a gas container**

**Properly secured with chains**



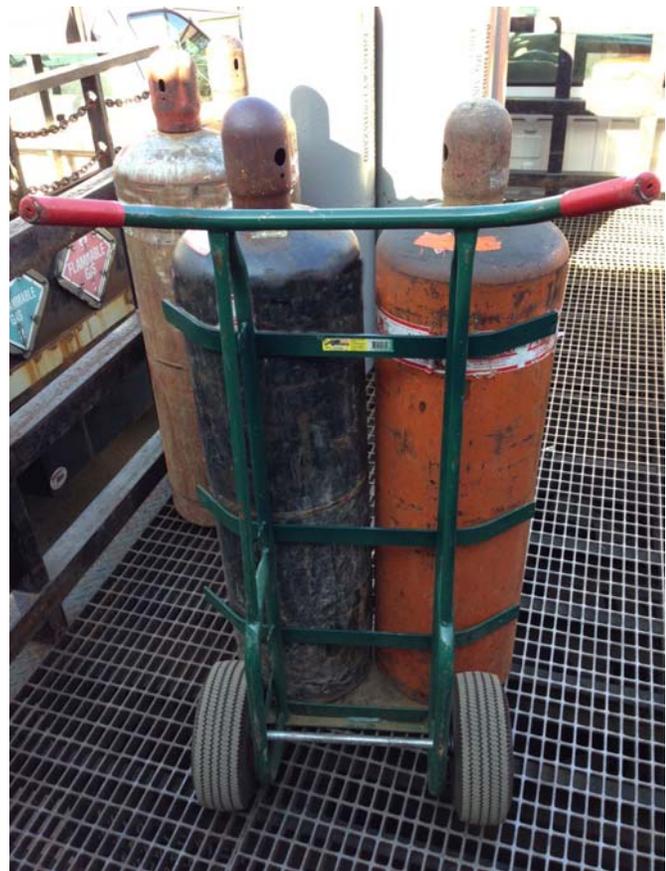
Containers shall be moved using an approved method. Avoid dragging or sliding containers. Never drop containers nor permit them to strike against each other or against other surfaces violently. It is safer to move containers even short distances by using a suitable truck.

Where containers are moved by hand cart, hand truck or other mobile device, such carts, trucks or devices

shall be designed for the secure movement of containers. Carts and trucks used to move materials shall not obstruct or be left unattended in any corridor, exit enclosure, or other means of egress. Incompatible materials **shall not** be moved on the same cart or truck.

Carts and trucks utilized for moving compressed gas containers indoors shall be designed to provide a stable base for such movement during handling and shall have a means of restraining containers to prevent accidental dislodgement. Compressed gas containers placed on carts and trucks shall be individually restrained. Carts and trucks shall be provided with a device that will enable the operator to safely control movement by providing stops or speed-reduction devices.

**Ropes, chains or slings shall not be used to suspend compressed gas containers unless such containers have been designed for such handling.** Valves of compressed gas containers shall not be used for lifting.



## CHECK FOR LEAKS

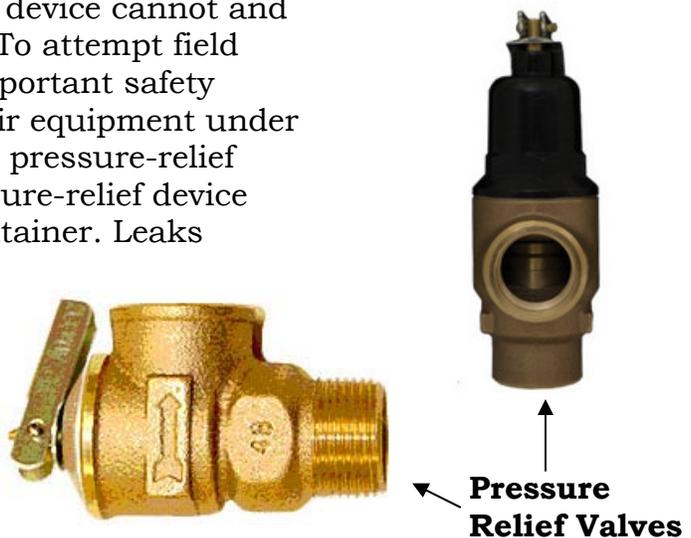
The gas containers, valves, hoses, and related equipment should be inspected for physical damage. Special care should be taken to identify any defects that may cause a leak. **Any defective components that are discovered must be marked and be replaced before the equipment can be used again.** If any leak of gas is detected, move the gas container to an isolated, well-ventilated area away from combustible materials. Post signs that describe the hazard. The **Certificate of Fitness holder must not attempt to do any repairs, but only take the equipment out of service.** This equipment is very sensitive and must be picked up and repaired by the supplier only. When a major leak occurs in a piping system, the Certificate of Fitness holder must shut off the main control valve.

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 gas container in areas such as the valve threads, pressure safety device, valve stem and valve outlet. If a leak is present, the operator will hear a whistling sound.

The greatest leak potential is with the container valve. There are four distinct areas where leaks at the container valve can occur:

**1. Valve Threads:** leaks which occur where the valve screws into the container are commonly referred to as “neck leakers.” These types of leaks cannot and should not be repaired in the field. Equipment which has leaks should be send back to the supplier.

**2. Pressure-Relief Device:** Leaks can occur at two points on the pressure-relief device-around its threads or through its relief channel. Again, leaks at the pressure-relief device cannot and must not be repaired in the field. To attempt field repair is a violation of two very important safety practices. NEVER attempt to repair equipment under pressure and NEVER tamper with pressure-relief devices. Tampering with the pressure-relief device compromises the safety of the container. Leaks through the pressure relief channel can become severe, and all personnel must be evacuated from the immediate area. The supplier must be contacted for immediate assistance.



**3. Valve Stem:** Leaks at this location can be stopped by closing the valve and venting any pressure from the outlet. Leaks of this type should be reported to your supplier so you can be advised if that particular valve design will allow a packing adjustment to correct the problem or if arrangements must be made for a safe and proper return of the container. Diaphragm valves cannot be repaired or adjusted in the field.

**4. Valve Outlet:** A pressure-tight outlet seal can be installed when proper closing procedures fail to completely stop leakage. Leaks in the valve area are generally very small and do not normally change in size when the product in the container is flammable compressed gas. When the leak involves a corrosive product, however, the leak will generally worsen because the corrosive material attacks the leak point. Any flammable material that is being released to the atmosphere in an uncontrollable manner requires that proper actions be taken to minimize exposure to personnel and equipment.

These areas must be checked using a soap and water solution (see below). **NEVER CHECK FOR LEAKS WITH A FLAME.**



First ensure that all connections are tight. Then open the container valve. Each connection is checked by brushing or spraying a soap and water mixture on the connection. The connection should be checked to see if any air bubbles are present. If no air bubbles are visible there is no

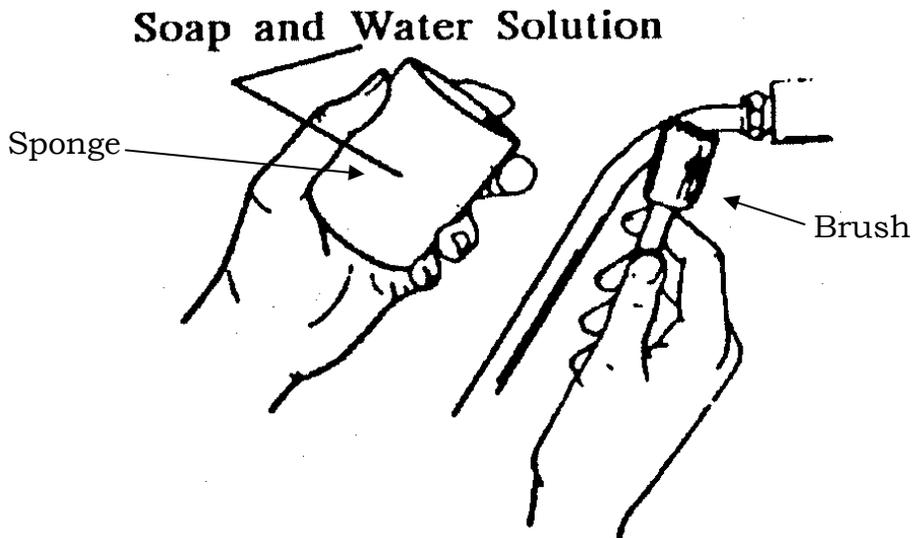
leak; however, if bubbles are present there may be a problem with the connection. The suspected fittings should be disconnected and cleaned.

Then the connection is tightened and the checking procedure is repeated. If the bubbles are still visible, there is a problem with the connection. The fittings should be repaired or replaced before the equipment is used again.

**A LIGHTED FLAME (SUCH AS A MATCH) SHOULD NEVER BE USED WHEN CHECKING A CONNECTION FOR A LEAK.**



**NO BUBBLES = NO LEAK**



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 out-of-service. Remove the leaking compressed gas container outdoors to an open area free from ignition sources. Notify the gas supplier and follow his instructions as to the return of the compressed gas container.

\* It is recommended that Certificate of Fitness holder inspects the immediate work area for potential ignition sources **daily**.

## STORAGE AND USE LIMITS

### MAXIMUM ALLOWANCE PER CONTROL AREA

This section addresses the 2008 New York City Fire Code applicable to **new or modified installations/facilities approved by the Fire Department on or after July 1<sup>st</sup>, 2008**. It also applies to any pre-existing installations that are requesting an increase of their previously **permitted storage quantities when the aggregate quantity will be in excess of the maximum allowable quantity (MAQ) listed below**.

**If the quantity of flammable gases is in excess of a previously permitted quantity in any pre-existing installations, a revised FDNY permit must be obtained.**

Flammable compressed gases shall not exceed the Maximum Allowable Quantity (MAQ) per control area indicated in the table on the next page. Quantities exceeding the MAQ shall be in gas rooms in accordance with the storage regulations.

**INDOOR STORAGE AND USE LIMITS**

**(Indoor storage is not allowed when outdoor storage is available)**

**Maximum allowable quantity of flammable gases, storage and used in closed systems, per INDOOR control area**

Building protected throughout by a sprinkler system?	Floor Level		Flammable Gases			
			NOT in Gas Cabinets or Exhausted Enclosures (SCF)	IN Gas Cabinets or Exhausted Enclosures (SCF)	Max # of Control Areas per floor	Min Fire-Resistance rating for Fire Barriers in hours
<b>NO</b>	Above Grade	>9	50	100	1	2
		7-9	50	100	2	2
		4-6	125	250	2	2
		3	500	1,000	2	1
		2	750	1,500	3	1
		1	1,000	2,000	4	1
	Below Grade	1	750	1,500	3	1
		2	500	1,000	2	1
		> 2	Not Allowed	Not Allowed	Not Allowed	Not Allowed
			NOT in Gas Cabinets or Exhausted Enclosures (SCF)	IN Gas Cabinets or Exhausted Enclosures (SCF)	Max # of Control Areas per floor	Min Fire-Resistance rating for Fire Barriers in hours
<b>YES</b>	Above Grade	>9	100	200	1	2
		7-9	100	200	2	2
		4-6	250	500	2	2
		3	1,000	2,000	2	1
		2	1,500	3,000	3	1
		1	2,000	4,000	4	1
	Below Grade	1	1,500	3,000	3	1
		2	1,000	2,000	2	1
		> 2	Not Allowed	Not Allowed	Not Allowed	Not Allowed

\*The above table indicates that with a sprinkler system **AND** in gas cabinets or exhausted enclosures you can store 4,000 SCF of flammable gas, the NYC Fire Code (Chapter 35) **restricts** the storage to only 3,500 SCF per control area.

There may be more than one storage location with 3,500 SCF (square cubic feet) of flammable gas stored in compressed gas container in a room, provided that each storage location does not exceed 3,500 SCF and the storage locations are separated by at least 50 feet or an approved masonry barrier having a minimum fire resistance rating of 2 hours.

The storage of flammable gas in any building or structure is restricted to a maximum of **15,000 SCF**.

**Construction sites may have a maximum quantity of 3,500 SCF per floor or 15,000 SCF per building.** Provided that the building undergoing construction is not occupied, MAQ requirements **do not apply** to the temporary storage of flammable materials for use at construction sites, and the temporary storage facilities in which they are kept.

In a building construction the MAQs and control area limitations would apply upon issuance of a certificate of occupancy or temporary certificate of occupancy.

The MAQs and control area limitations set forth in a table on a previous page are applicable to a \*construction site, only if the construction work is being conducted in a building that is occupied or partially occupied. In such circumstances, temporary storage of flammable materials in the portion of the building undergoing construction cannot exceed the MAQs and control area limitations without the prior written authorization of the Fire Department.

MAQs at construction sites apply to only in use storage. Reserve storage is NOT allowed.

**FLAMMABLE GASES DISTANCE FROM STORAGE AREAS TO EXPOSURE (3,500 SCF OR LESS) – INDOOR STORAGE**

<b>TYPE OF INDOOR EXPOSURE</b>	<b>DISTANCE TO INDOOR EXPOSURE</b>
1. Flammable and combustible liquids, 2. Oxidizing gases, 3. Readily combustible materials	<b>20 FEET</b>
1. Open flames, 2. Ordinary electrical equipment, 3. Sources of ignition	<b>25 FEET</b>
1. Air-conditioning equipment, 2. Air compressors, 3. Intakes of ventilation, 4. Other flammable gas storage	<b>50 FEET</b>

**OUTDOOR STORAGE AND USE LIMITS**

Outdoor storage of flammable gases shall be limited to a maximum storage of 3,500 SCF.

**DISTANCE REQUIREMENTS FROM OUTDOOR STORAGE AREAS TO EXPOSURES (AREAS WITH MORE THAN 1500 SCF, UP TO 3500 SCF)**

<b>TYPE OF OUTDOOR EXPOSURE</b>	<b>DISTANCE TO OUTDOOR EXPOSURE (FT)</b>
Building or structure of combustible construction	10*
Building openings	10
Flammable and combustible liquids Aboveground – 1,000 gallons or less	10*
Flammable and combustible liquids Aboveground – in excess of 1,000 gallons	20*
Flammable and combustible liquids Underground tank – 1,000 gallons or less	10*
Flammable and combustible liquids Underground tank – 1,000 gallons or less Vent or fill opening of tank	15*
Flammable and combustible liquids Underground tank – in excess of 1,000 gallons	15*
Flammable and combustible liquids Underground tank – in excess of 1,000 gallons Vent or fill opening of tank	15*
Flammable gas storage area, any pressure 1,500 SCF or less	10*
Flammable gas storage area, any pressure More than 1,500 SCF up to maximum 3,500 SCF	20*
Oxygen storage – 20,000 SCF or less	In accordance with NFPA 51*
Oxygen storage – in excess of 20,000 SCF	In accordance with NFPA 50*
Combustible material or combustible waste	10*
Air compressor intakes or inlets to ventilating or air-conditioning equipment	5
Group A occupancies and public gathering places	25
Public streets, private roads and lot lines	10*

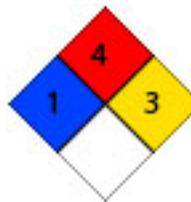
\* The minimum required distances shall be reduced to 5 feet when protective structures having a minimum fire-resistance rating of 2 hours interrupt the line of sight between the container and the exposure. The protective structure shall be at least 5 feet from the exposure. The configuration of the protective structure shall be designed to allow natural ventilation to prevent the accumulation of flammable gas concentrations.

**Maximum allowable quantity per OUTDOOR control area.**

<b>Material</b>	<b>Class</b>	<b>Capacity in Storage</b>	<b>Capacity in Use - Closed Systems</b>
<b>Flammable Gas</b>	Gaseous	*1,000 (SCF)	*1,000 (SCF)
	Liquefied	*15 liquid gallons	*15 liquid gallons

## COMMON FLAMMABLE COMPRESSED GASES

**Acetylene** a colorless, flammable gas with a garlic-like odor. Acetylene has the highest flame temperature of any common hydrocarbon because of its triple-bond structure H-C≡C-H. Its high flame temperature allows it to be used in a variety of metal working applications like cutting, welding, brazing, and soldering.



**Auto-ignition temperature** is 581°F.

**Flammable limits:**      **Lower:** 2.5% **Upper:** 100%

**Products of combustion:** carbon dioxide, carbon monoxide.

**Vision Protection:** Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

**Respiratory Protection:** Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

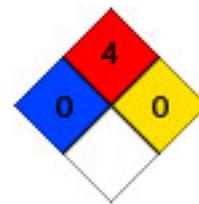
**Skin Protection:** Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**Extinguishing Media:** Carbon Dioxide, Dry Chemical, Water. Do not extinguish a gas fire unless effective immediate shut-off of gas flow is possible. Explosive vapor could form. Keep adjacent containers cool by spraying large amounts of water until the fire burns itself out and the containers are cool. If a flame is extinguished and acetylene continues to escape, an explosive reignition could occur.

### ACCIDENTAL RELEASE MEASURES

If this material is released into a work area, evacuate the area immediately. Isolate hazard area. Eliminate any possible sources of ignition, provide maximum explosion proof ventilation. Shut off source of acetylene, if possible. Isolate any leaking container. If leaking is from the container, valve or fusible metal pressure relief device, contact your supplier. Never enter a confined space or other area where the concentration is greater than 10% of the lower flammable limit which is 0.25%.

**Hydrogen** is a colorless, odorless, tasteless, non-toxic, nonmetallic, highly combustible diatomic gas (at standard temperature and pressure). Hydrogen is extremely flammable and can cause rapid suffocation and may also cause a severe frostbite.



**Hazards:**

Target organs are lungs.

**Eyes and Skin:** Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

**Inhalation:** Acts as a simple asphyxiant.

**Work/Hygienic Practices**

**Eyes:** Approved safety eyewear should be used when it is necessary to avoid exposure to liquid splashes, mists or dust. Check for and remove any contact lenses. If came in contact immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

**Hands/Skin:** Wear chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately.

**Inhalation:** Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary.

If you become exposed to hydrogen gas move to fresh air. If breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

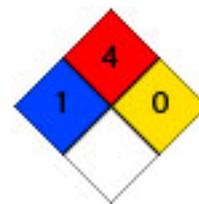
**Auto-ignition point:** 932 to 1059.8°F

**Flammable limits: Lower:** 4% **Upper:** 76%

**ACCIDENTAL RELEASE MEASURES**

Evacuate immediate area. Eliminate any possible sources of ignition. Shut off source of hydrogen, if possible. The presence of a hydrogen flame can be detected by approaching cautiously with an outstretched straw broom to make the flame visible.

**Methane** is not toxic; however, it is extremely flammable and may form explosive mixtures with air. Methane is a colorless, odorless, compressed gas packaged in containers under high pressure. It poses an immediate fire and explosion hazard when mixed with air at concentrations exceeding 5.0%. High concentrations that can cause rapid suffocation are within the flammable range and should not be entered.



**Emergency Overview:**

**Eyes:** Has no harmful affect, no treatment is necessary.

**Inhalation:** Methane is nontoxic. It can, however, reduce the amount of oxygen in the air necessary to support life. Exposure to oxygen-deficient atmospheres may produce dizziness, nausea, vomiting, loss of consciousness, and death. At very low oxygen concentrations (less than 12 %) unconsciousness and death may occur without warning. It should be noted that before suffocation could occur, the lower flammable limit for Methane in air will be exceeded; causing both an oxygen deficient and an explosive atmosphere. If treatment is needed move to fresh air and if not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

**Auto-ignition point:** 999 °F

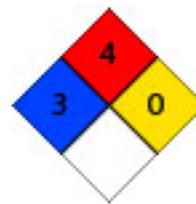
**Flammable limits: Lower:** 5% **Upper:** 15%

**EXTINGUISHING MEDIA:** Dry chemical, carbon dioxide, or water.

**ACCIDENTAL RELEASE MEASURES**

Evacuate immediate area. Eliminate any possible sources of ignition. Use a flammable gas meter (explosimeter) calibrated for Methane to monitor concentration. Never enter an area where Methane concentration is greater than 1.0% (which is 20% of the lower flammable limit). An immediate fire and explosion hazard exists when atmospheric Methane concentration exceeds 5.0%. Use appropriate protective equipment (SCBA and fire resistant suit). Isolate any leaking container. If there is a leak from the container, pressure relief device or its valve, contact your supplier.

**Methylamine** is a colorless gas and is a derivative of ammonia, but with one H atom replaced by a methyl group. Methylamine is a liquefied flammable gas.



**Emergency Overview:**

**Flash Point:** -0.4 °F.

Exposure to Methylamine may cause liver and lung damage. Causes eye and skin burns. May cause respiratory and digestive tract burns. Harmful if inhaled. May be harmful if absorbed through the skin.

**Target Organs** are liver, respiratory system, eyes, and skin.

**Hazards:**

**Eyes:** May result in corneal injury. May cause chemical conjunctivitis and corneal damage, tearing, conjunctivitis and corneal edema when vapor is absorbed into the tissue of the eye.

**Skin:** Causes skin burns. May be absorbed through the skin. May cause dermatitis. May cause malaise, discomfort, injury and death unless treated promptly.

**Inhalation:** Causes chemical burns to the respiratory tract. May cause coughing, nausea, pulmonary edema and severe respiratory disturbances. May cause liver abnormalities.

\* **Effects may be delayed.**

**First Aid Measures:**

**Eyes:** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

**Skin:** In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

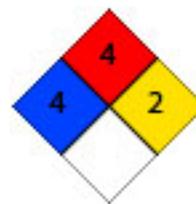
**Inhalation:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Extinguishing Media:** Use water spray, dry chemical, or "alcohol resistant" foam.

**ACCIDENTAL RELEASE MEASURES**

**Spills/Leaks:** Avoid runoff into storm sewers and ditches which lead to waterways. Wear a self contained breathing apparatus and appropriate personal protection. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Approach spill from upwind. Use only non-sparking tools and equipment. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures. 5% sulfuric acid may be used to neutralize diluted pools.

**Carbon Monoxide** is a colorless, odorless, and tasteless gas that is slightly lighter than air.



**Emergency Overview:** MAY CAUSE FLASH FIRE. MAY BE FATAL IF INHALED. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Avoid breathing gas. May cause target organ damage, based on animal data. When exposed to Carbon Monoxide, targeted organs are blood, lungs, the nervous system, heart, cardiovascular system, central nervous system (CNS). Use only with adequate ventilation. Keep container closed.

**Auto-ignition temperature:** 1121°F

**Flammable limits: Lower:** 12.5% **Upper:** 74.2%

**Fire-fighting media and instructions:** In case of fire, use water spray (fog), foam or dry chemical. In case of fire, allow gas to burn if flow cannot be shut-off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut-off flow immediately if it can be done without risk.

**Personal Protection:**

**Skin/Hands:** Personal protective equipment should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling.

**Respiratory:** Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product, and the safe working limits of the selected respirator.

**First Aid Measures:**

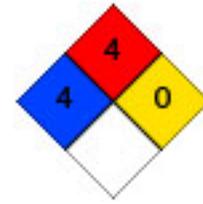
**Eye contact:** Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

**Inhalation:** Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**ACCIDENTAL RELEASE MEASURES**

Personal precautions: Immediately contact emergency personnel. Keep unnecessary personnel away. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

**Hydrogen-Sulfide** is a colorless gas with the foul odor of rotten eggs. It is heavier than air, very poisonous, corrosive, flammable and explosive. The odor cannot be relied on as an adequate warning of the presence of Hydrogen Sulfide because at high concentrations olfactory fatigue occurs. Inhalation of high concentrations of this gas can result in unconsciousness, coma, and death. Hydrogen Sulfide poses an immediate fire hazard when mixed with air. The gas is heavier than air, and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of the Hydrogen Sulfide container can cause the container to explode without activating the container's relief devices. Provide adequate fire protection during emergency response situations. Repeated exposure can damage respiratory system, skin, and central nervous system.



**Auto-ignition:** 500 °F

**Flammable limits: Lower:** 4.0% **Upper:** 44%

#### **FIRST AID MEASURES:**

**Eyes:** If liquid is splashed into eyes, or if irritation of the eye develops after exposure to Hydrogen Sulfide, open victim's eyes while under gentle, lukewarm, running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention from an ophthalmologist.

**Inhalation:** Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

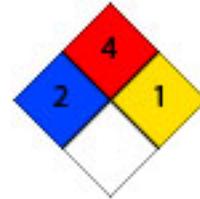
#### **ACCIDENTAL RELEASE MEASURES**

Evacuate immediate area. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Shut off source of leak, if possible. Isolate any leaking container. If leak is from container, pressure relief device or its valve, contact your supplier. All responders must be adequately protected from exposure. Monitoring should be done for the levels of Hydrogen Sulfide. Colorimetric tubes are available to detect the presence of Hydrogen Sulfide. Extinguish Hydrogen Sulfide fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Other appropriate extinguishing media are dry chemical, foam, and carbon dioxide.

**Vinyl Chloride** is a gas with a sweet odor. It is highly toxic, flammable, and carcinogenic. MAJOR HEALTH HAZARDS: harmful if swallowed, skin irritation, eye irritation, central nervous system depression, cancer hazard.

**Autoignition:** 882 F

**Flammable limits: Lower** 3.6% **Upper:** 33%



**First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

**Skin Contact:** If frostbite or freezing occur, immediately flush with plenty of lukewarm water 105-115 F. **DO NOT USE HOT WATER.** If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

**Eye Contact:** Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

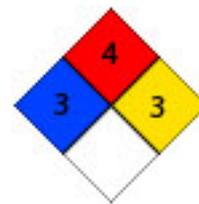
**Fire and Explosion Hazards:** Severe fire hazard. Severe explosion hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

**Extinguishing Media:** carbon dioxide, regular dry chemical. For large fires use regular foam or flood with fine water spray.

**ACCIDENTAL RELEASE MEASURES**

Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering.

**Ethylene oxide** is extremely flammable and explosive and is used as a main component of thermobaric weapons; therefore, it is commonly handled and shipped as a refrigerated liquid. The handling and use of flammable compositions of ethylene oxide, including the cleaning and maintenance of the sterilizer, shall be under the personal supervision of a person holding a Certificate of Fitness.



When exposed to ethylene oxide one may damage organs such as blood, kidneys, lungs, the reproductive system, liver, upper respiratory tract, skin, eyes, and central nervous system (CNS).

**Auto-ignition:** 428.88°C (804°F)

**Flammability limits: Lower:** 3% **Upper:** 100%

### **First Aid Measures**

**Eyes:** Persons with potential exposure should not wear contact lenses. Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. Repeat for subsequent 15 minute periods if irritation returns. Seek immediate medical attention.

**Skin:** Remove contaminated clothing and flush affected areas with large amounts of lukewarm water. Delayed burns may result. Seek immediate medical attention.

### **EXTINGUISHING MEDIA:**

Water mist or spray. Carbon dioxide, dry chemicals and foams. Ethylene oxide must be diluted 22 times by volume in water before it is no longer flammable.

### **ACCIDENTAL RELEASE MEASURES**

Evacuate all personnel from the affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

Empty or underweight containers, containers with past expiration dates, and containers which fail to open in the sterilizer shall be kept separate from other containers and promptly removed from the premises and lawfully disposed of. Containers shall not be incinerated.

**Room Ventilation:** Rooms in which sterilization systems are installed shall be equipped with ventilation systems that provide not less than 10 air changes per hour.

### **Sprinkler System**

Sterilization systems shall be located in a room or other area protected by a sprinkler system.

### **Proximity to hazard**

Sterilization systems shall be installed away from sources of heat and ignition, means of egress and areas of activity. They shall not be installed in any room or other area in which flammable liquids or flammable gases, other than sterilizer gases, are stored, handled or used.

### **Ventilation**

Rooms in which sterilization systems are installed shall be equipped with ventilation systems that provide not less than 10 air changes per hour. When a local ventilation system is required by the regulations of the United States Department of Labor, such ventilation system shall comply with the following requirements:

- 1) At each discharge location there shall be a durable sign, conspicuously posted, that reads **“Danger – Flammable Gas.”**
- 2) Signage shall appear on the duct at intervals of not more than 20 feet and at least once in each room and each story traversed by the duct. Such signage shall be by means of metal tags, stenciling, stamping or adhesive markers, which shall be attached or imprinted in a manner that is not readily removable.

### **Vent lines**

1. At each discharge location there shall be a durable sign, conspicuously posted, that reads **“Danger-Flammable Gas.”**
3. Signage shall appear on the vent line at intervals of not more than 20 feet and shall be present in at least one place in each room and in each story traversed by the duct.
2. Vent terminals shall be provided with a flash arrester, provided that the supplier of the sterilizer or the testing laboratory does not prohibit same. The flash arrester, when used, shall be constructed of material compatible with ethylene oxide and installed in such a manner as not to restrict gas flow.

### **Storage**

Only containers of the type, composition and size approved by the supplier for the particular model of sterilization system shall be stored or used.

A one-day supply of flammable gases that contain ethylene oxide, but no more than 12 containers, may be stored in its original packaging in the room or other area in which the sterilizer is installed, provided that:

- 1) Such room or other area is above grade.

2) The containers are stored at room temperature, away from sources of heat and ignition.

3) The containers are stored not less than 5 feet from the sterilizer, on open shelving protected by a sprinkler system or in an approved flammable liquid storage cabinet.

In addition to the amounts specified in the section above, a maximum of 3 gallons liquid volume of flammable gases that contain ethylene oxide may be stored in their original packaging in a flammable gas storage room - provided that such storage room meets the requirements of the construction codes, including the Building Code, is located above grade, is away from sources of heat and ignition, and is protected by a sprinkler system.

Storage of flammable gases that contain ethylene oxide, in excess of 3 gallons liquid volume, shall be in a detached above grade building designed for the storage of flammable gas. See table below for details.

<b>Quantity of gas per container (grams)</b>	<b>Maximum number of containers not exceeding 3 gallon limit</b>
100	99
134	73
150	66
170	58
200	49

Sterilization systems shall be operated and maintained in compliance with the following requirements:

- The quantity of flammable gases that contain ethylene oxide connected to the sterilizer at any one time shall be no more than required for a single sterilization cycle and in no case more than 200 grams net weight.
- Containers shall be opened only while connected to the sterilizer in the manner specified by the supplier of the sterilizer.
- Empty or underweight containers, containers with past expiration dates, and containers which fail to open in the sterilizer shall be kept separate from other containers and promptly removed from the premises and lawfully disposed of. Containers shall not be incinerated.
- At least one portable fire extinguisher having a minimum 40 B:C rating shall be provided in the area where flammable gases containing ethylene oxide are stored or used. The maximum travel distance to such extinguisher shall not exceed 30 feet.

## FIRE EXTINGUISHER AND EMERGENCY RESPONSES

### INSTALLATION AND PLACEMENT

Fire extinguishers must be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations must be along normal paths of travel. Fire extinguishers having a gross weight 40 pounds or less must be installed so that the top of the extinguisher is not more than 5 ft above the floor. Hand-held fire extinguishers having a gross weight exceeding 40 pounds shall be installed so that their tops are not more than 3.5 feet above the floor. The clearance between the floor and the bottom of installed hand-held extinguishers shall not be less than 4 inches.

**In other words, no fire extinguisher is allowed to be on the floor.**



- (1) For a fire extinguisher weighing 40 pounds or less, its top must not be more than 5 ft above the floor
- (2) The fire extinguisher must be accessible and unobstructed.



- (1) The bottom of the fire extinguisher must be at least 4 inches above the floor.
- (2) The fire extinguisher must be properly mounted.

Minimum sizes of fire extinguishers for Class B hazard shall be provided in accordance will below chart:

**Fire Extinguisher Size and Placement for Class B Hazards**

Type of Hazard	Basic Minimum Extinguisher Rating	Maximum Travel Distance to Extinguishers	
		ft	m
Light (low)	5-B	30	9.15
	10-B	50	15.25
Ordinary (moderate)	10-B	30	9.15
	20-B	50	15.25
Extra (high)	40-B	30	9.15
	80-B	50	15.25



Weight ≤ 40 lbs



In the event that a fire extinguisher has been discharged, a fully charged replacement is required before work can resume. Portable fire extinguishers are important in preventing a incipient fire from growing into a catastrophic fire; however, they are not intended to fight large or spreading fires. By the time the fire has spread, fire extinguishers, even if used properly, will not be adequate to extinguish the fire. Such fires should be extinguished only by the building fire extinguishing systems or trained firefighters.

In case of any fire, 911 **MUST** be called. Fire extinguishers must be used in accordance with the instructions painted on the side of the extinguisher. They clearly describe how to use the extinguisher in case of

an emergency. The Certificate of Fitness holder should be familiar with the use of portable fire extinguishers. When it comes to using a fire-extinguisher just remember the acronym **P.A.S.S.** to help ensure you use it properly. P.A.S.S. stands for Pull, Aim, Squeeze, Sweep. An example of these instructions is depicted in the image on the left.



## OPERATING INSTRUCTIONS FOR A FIRE EXTINGUISHER

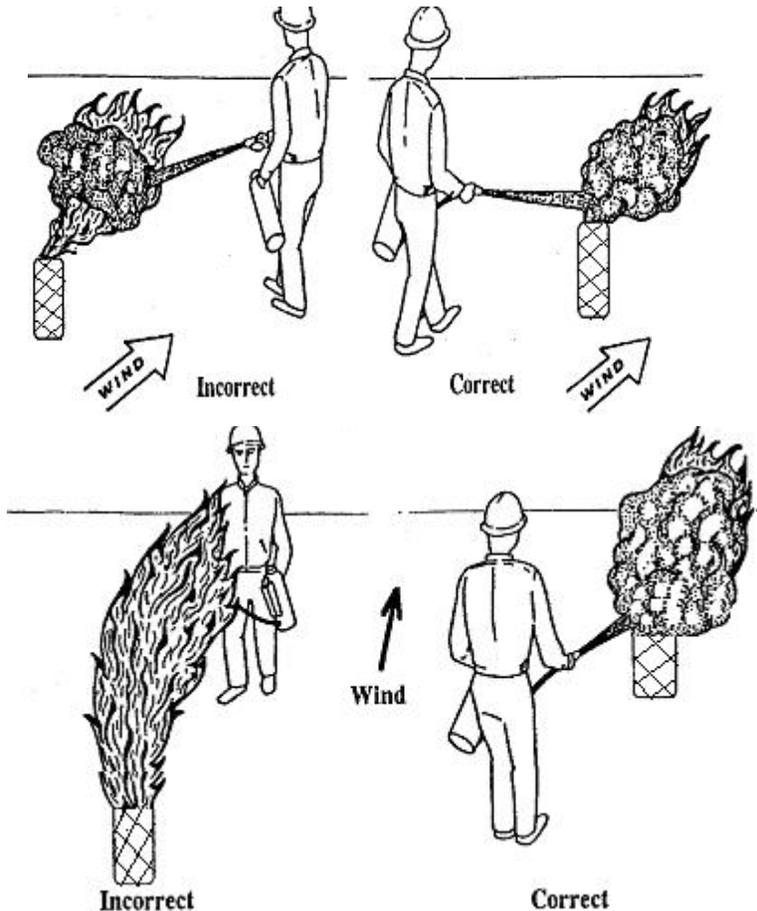
Special care must be taken when extinguishing a fire caused by a gas leak. The easiest way to extinguish the fire is to shut off the source by using the **Emergency Shut Off** valve until the flame is extinguished. The flame must be approached from an upwind direction. This will prevent the Certificate of Fitness holder from being burned by the flames. **Never approach a fire from a downwind direction.**

The dry chemical stream must be directed toward the point where the flame begins. **Do not direct the chemical stream at the center of the flame.** This will not extinguish the fire

**In relation to a fire connected piped gas, the gas supply must be shut off first and 911 must then be called.**

This is safer than allowing the flammable gas to leak out. A flammable gas leak could result in a serious explosion if it were ignited. **Never attempt to extinguish the**

**flame unless the gas supply is shut.** When it is not possible to shut off the gas supply (e.g. the fire is near the control valve or the shut-off valve), allow the flame to burn itself out while calling 911. In the mean time, you should try to control the scene and prevent the fire from spreading to the surrounding materials. **The Certificate of Fitness holders should only consider extinguishing fires when they are limited in size such that they can readily be extinguished using a portable fire extinguisher.** Fire extinguishers, even if used properly, will not be adequate to extinguish the fire by the time the fire has spread. Such fires should only be extinguished by the building fire extinguishing systems or trained firefighters only.



## **TYPES OF FIRE EXTINGUISHERS**

The Certificate of Fitness holder must be familiar with the different types of fire extinguishers that are present. They must know how to operate the extinguishers in a safe and efficient manner. They must know the difference between the various types of extinguishers and when they should be used. A description of the four classes of fires and the appropriate extinguishers are described below.

**Class A** fires are caused by ordinary combustible materials (such as wood, paper, and cloth). To extinguish a Class A fire, these extinguishers utilize either the heat-absorbing effects of water or the coating effects of certain dry chemicals.

**Class B** fires are caused by flammable or combustible liquids and gases such as oil, gasoline, etc. To extinguish a Class B fire, the blanketing-smothering effect of oxygen-excluding media such as CO<sub>2</sub>, dry chemical or foam is most effective.

**Class C** fires involve live electrical equipment. These fires must be fought with fire extinguishers that do not conduct electricity. Foam and water type extinguishers must not be used to extinguish electrical fires. After the power has been isolated from the electrical equipment, extinguishers for Class A or B fires may be used.

**Class D** fires are caused by ignitable metals, such as magnesium, titanium, and metallic sodium, or metals that are combustible under certain conditions, such as calcium, zinc, and aluminum. Generally, water should not be used to extinguish these fires.

A multi-purpose dry chemical fire extinguisher may be used to extinguish more than 2 Classes fires. Examples of some fire extinguishers are shown on the next page.

## EXAMPLES OF FIRE EXTINGUISHERS



Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguisher may be used upon. Examples of these symbols are shown below.

CLASSES OF FIRES	TYPES OF FIRES	PICTURE SYMBOL
<b>A</b>	Wood, paper, cloth, trash & other ordinary materials.	
<b>B</b>	Gasoline, oil, paint and other flammable liquids.	
<b>C</b>	May be used on fires involving live electrical equipment without danger to the operator.	
<b>D</b>	Combustible metals and combustible metal alloys.	

A Trash+Wood+Paper	B Liquids	C Electrical Equip.	For Class A types For all water-based types
			
A Trash+Wood+Paper	B Liquids	C Electrical Equip.	For Class A, B types (1) AFFF (2) FFFP
			
	B Liquids	C Electrical Equip.	For Class B, C types (1) Carbon dioxide (2) Dry chemical (3) Halogenated agents
			
A Trash+Wood+Paper	B Liquids	C Electrical Equip.	For Class A, B, C types (1) Halogenated agents (2) Multipurpose dry chemical
			

### FIRE EXTINGUISHER IDENTIFICATION SYMBOLS

The symbol with the shaded background and the slash indicates when the extinguisher must not be used. The Certificate of Fitness holder must understand these symbols. All fire extinguishers should be kept in good working order at all times.

### FIRE EXTINGUISHER INSPECTIONS

The extinguishers are required to be inspected monthly. The owner of the premises is responsible to designate a person to perform a monthly

inspection. This inspection is a "quick check" that a fire extinguisher is available and will operate.

Periodic “**monthly**” inspections of fire extinguishers **SHALL** include a check of the following items:

- (a) **Location in designated place**
- (b) **No obstruction to access or visibility**
- (c) **Operating instructions on nameplate legible and facing outward**
- (d) **Safety seals and tamper indicators not broken or missing**
- (e) **Fullness determined by weighing or “hefting”**
- (f) **Examination for obvious physical damage, corrosion, leakage, or clogged nozzle**
- (g) **Pressure gauge reading or indicator in the operable range or position**
- (h) **Condition of tires, wheels, carriage, hose, and nozzle checked (for wheeled units)**



Monthly inspection tag

Monthly “quick checks” are intended to give reasonable assurance that the fire extinguisher is fully charged and operable. This is done by verifying that it is in its designated place, that it has not been actuated or tampered with, and that there is no obvious or physical damage or condition to prevent its operation.

### **Frequency**

1. Fire extinguishers shall be **manually inspected when initially placed in service.**

2. They shall be inspected either manually or by an electronic mean once a month.

**3. Fire extinguishers should be visually inspected more often especially where any of the following conditions exist:**

- (1) High frequency of fires in the past
- (2) Severe hazards
- (3) Locations that make fire extinguishers susceptible to mechanical injury or physical damage
- (4) Exposure to abnormal temperatures or corrosive atmospheres

When an inspection of any fire extinguisher reveals a deficiency in any of the conditions listed above, immediate corrective action shall be taken.

### **MONTHLY INSPECTION RECORD KEEPING**

- During the inspection the individual should date and initial the tag.
- Where manual inspections are conducted, records for manual inspections shall be **kept on a tag or label attached** to the fire extinguisher, on an inspection checklist maintained on file, or by an electronic method.
- Records shall be kept to demonstrate at least the **last 12 monthly** inspections have been performed
- Annually, ALL fire extinguishers must be serviced and recharged annually by a FDNY approved company and a W-96 Certificate of Fitness holder. **(Dry chemical fire extinguisher need to be recharged when the gauge needle points to the red area.)**

### **SOURCES OF IGNITION**



It shall be unlawful to smoke in the following locations, and “No Smoking” signs shall be provided in English as a primary language and in symbols:

1. Within 25 feet of outdoor flammable material storage, handling and use areas, including dispensing areas. Smoking is never permitted in flammable gas container storage areas.
2. Facilities or areas within facilities in which smoking has been entirely prohibited shall have “No Smoking” signs conspicuously placed at all entrances to the facility or area.
3. Facilities or areas within facilities in which smoking is permitted in designated areas shall have signs indicating that smoking is permitted in designated areas only.
4. In rooms or areas where flammable or combustible flammable materials are stored, handled or used.

## **FIRE NOTIFICATION**

Anyone becoming aware of any fire is required to immediately notify the emergency operator (911). The Fire Department will respond. No supervisor or other person shall issue any directive or take any action to prevent or delay the reporting of a fire or other emergency to the department. You should also notify the building's designated fire safety person who is familiar with the building and can meet the responding emergency units upon their arrival, and direct them quickly to the fire area.

The Certificate of Fitness holder must know the locations of manual fire alarm system pull stations and portable fire extinguishers and how to operate them. In addition to calling 911, the Certificate of Fitness holder must activate the fire alarm system manual pull station. Activation of the manual pull station will sound the alarm in the plant.

The Certificate of Fitness holder may need to initiate an orderly evacuation when required by the hazard presented by any release of fuel gas and take reasonable steps to isolate the hazard until the Fire Department arrives. The Certificate of Fitness holder must answer any questions asked by Fire Fighters when they arrive. For example, he or she must indicate the location of the fire, describe the type of fire protection devices available, and describe the materials stored on the fire floor. The Bureau of Fire Prevention must be notified as soon as possible after an explosion or fire has occurred. The Bureau of Fire Prevention may require a detailed report on the causes and the consequences of the explosion or fire. Generally, this report must be filed within ten days after the incident.

## **SIGNIFICANT RELEASE**

In the event of a significant release of gas that poses a threat to employees and/or the environment, immediately evacuate the area and notify the emergency operator (911). The New York City Fire Department will respond. You are then required to notify your supervisor.