

**FIRE DEPARTMENT • CITY OF NEW YORK**



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

**G-41 USE OF LPG/CNG FOR TORCH-APPLIED ROOF SYSTEMS  
(on page 1-39)**

**G-42 USE OF LPG/CNG FOR ALL ROOFING OPERATION (ASPHALT  
MELTER, TAR KETTLE AND TORCH-APPLIED ROOF SYSTEMS) (on  
page 1-44)**

**The G-41 and G-42 tests are scheduled to be available on 1/25/2016**

Operation	Connecting to oxygen container?	Qualified Certificate of Fitness
LPG/CNG Torch operation for torch-applied roof systems	No	G-41, G-42 or G-60
Use of LPG/CNG for asphalt melter or tar kettle	No	G-40, G-42
Use of oxygen and flammable gases or LPG or CNG for any hot work operation	Yes	G-60
Use of oxygen and piped natural gas for hot work operation in jewelry manufactures and dental lab facilities	Yes	G-61

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## NOTICE OF EXAMINATION

**Title:**                   **Certificate of Fitness for Use of LPG/CNG for Torch-Applied Roof Systems (G-41)**  
                                  **Certificate of Fitness for Use of LPG/CNG for Torch-Applied Roof Systems and Asphalt melter (G-42)**

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

### REQUIREMENTS FOR WRITTEN EXAM

Applicants who 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 form of identification must be government issued photo identification, such as a State-issued Drivers' 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. (1) The applicants who pass **the G-60 Certificate of Fitness exam are NOT REQUIRED to obtain the G-41 Certificate of Fitness**, but are allowed to pay the additional \$25 fee to obtain the G-41 Certificate of Fitness.  
(2) The applicants who pass **the G-42 Certificate of Fitness exam are NOT REQUIRED to obtain the G-41 and/or G-40 Certificate of Fitness**, but are allowed to pay the additional \$25 fee to obtain the G-41 or G-40 Certificate of Fitness.

#### **8. 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.

## 9. **EXAM INFORMATION**

The **G-41** exam will consist of **25** multiple-choice questions and The **G-42** exam will consist of **30** multiple-choice questions. Exams are time-limit exams. It is a time-limit exam. Based on the amount of the questions, you will have **38 minutes to complete the G-41 exam** and **45 minutes to complete the G-42 exam**, and administered on a “touch screen” computer monitor. 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.

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\\_41\\_st\\_mat.pdf](http://www.nyc.gov/html/fdny/pdf/cof_study_material/g_41_st_mat.pdf)

10. 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.

## **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://a836-citypay.nyc.gov/citypay/FDNYCOF>

- **Renewal by mail**

Mail your Renewal Notice (or 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 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, 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

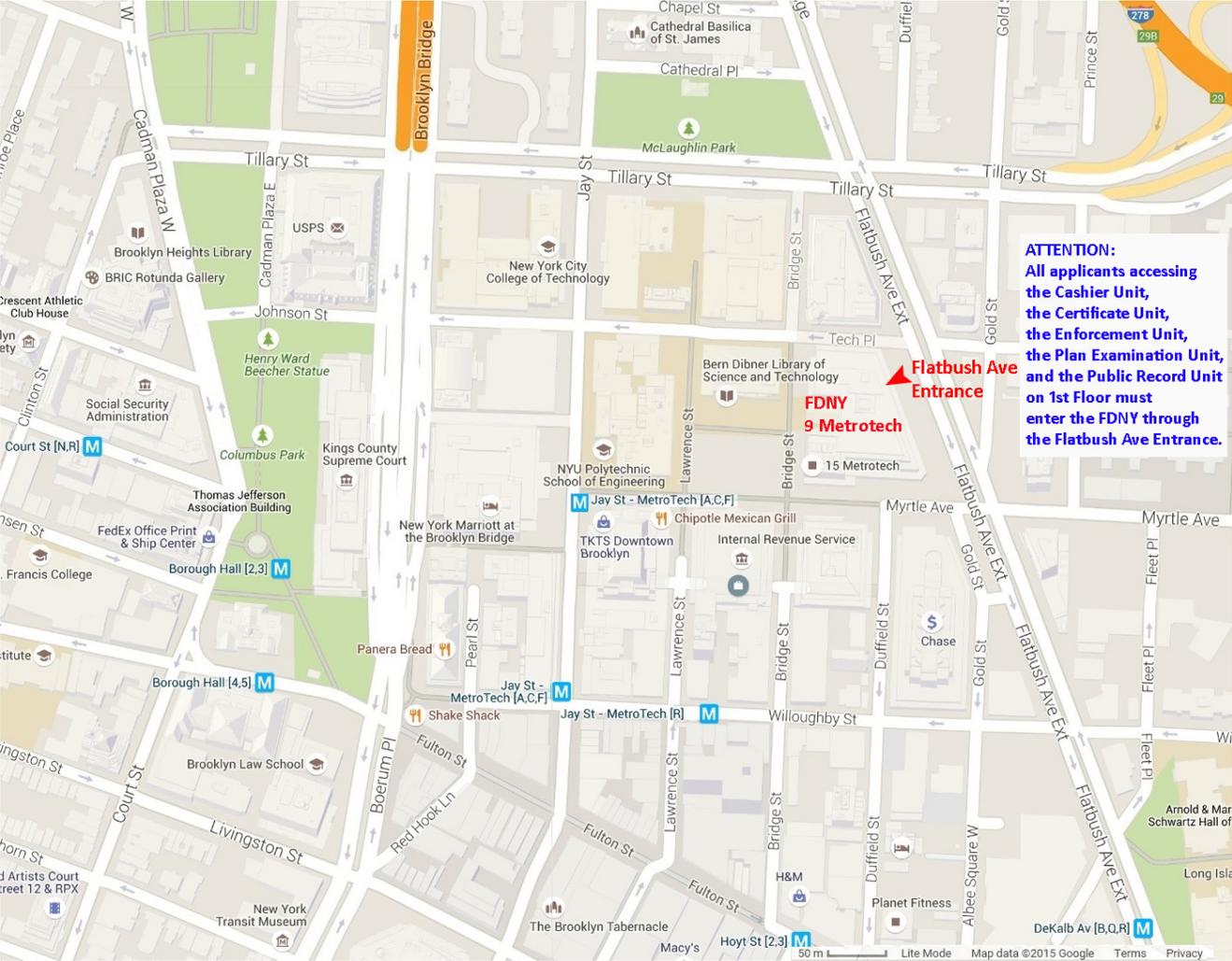
9 MetroTech Center, 1st Floor

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 two examinations of (1) the Certificate of Fitness for Use of LPG/CNG for torch-applied roof systems (G-41) and (2) the Certificate of Fitness for Use of LPG/CNG for torch-applied roof systems, asphalt melter and tar kettle (G-42). The study material includes information taken from the Fire Prevention Code of the Bureau of Fire Prevention. The exam covers the entire booklet and any tables. **It will not be provided to you during the test. It is critical that you read and understand this booklet to help increase your chance of passing this exam.** The study material does not contain all of the information you need to know to work with a torch. It is your responsibility to become familiar with all applicable rules and regulations of the City of New York, even if they are not covered in this study material. You need to be familiar with the National Fire Protection Association (NFPA) 51B, and Fire Code Chapter 26, Chapter 35, and Chapter 38 which regulate the torch use of flammable gases in order to adequately prepare for the exam.

### About the Test

Questions on both G-41 and G-42 Certificate of Fitness examination are of the multiple choice type with four alternative answers to each question. Only one answer is most correct for each question. If you do not answer a question, or if you mark more than one alternative your answer 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 cannot assist applicants

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

## INTRODUCTION

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This document outlines New York City Fire Department regulations for hot work operation. Hot work processes are a necessary part of much construction work and industrial work. However, the improper use is often a major cause of fire and it can result in loss of life and property.

### Certificate of Fitness

According to the Fire Code, a Certificate of Fitness is needed for connecting and disconnecting of LPG containers with a capacity greater than 16.4 oz or CNG containers with a capacity greater than 8.7 SCF.

In addition, the following torch operation must be conducted by a qualified Certificate of Fitness:

Operation	Connecting to oxygen container?	Qualified Certificate of Fitness
Torch operation for torch-applied roof systems	No	G-41, G-42 or G-60
Oxygen fuel torch using any amount of oxygen and flammable gas	Yes	G-60
Use of LPG/CNG for asphalt melter	No	G-40, G-42

Exception:

Torch operations using oxygen container and **piped natural gas** for jewelry manufacture may be performed by a person without a C of F, but must be under the personal supervision of a G-61 Certificate of Fitness holder, who must regulate the pressure and flow of oxygen and natural gas to each torch.

**The Certificate of Fitness holder must keep the Certificates of Fitness upon his or her person or otherwise readily available for inspection by any representative of the Department, at all times while conducting or supervising the material, operation or facility for which the certificate is required.**

### FDNY Permit

FDNY permit is required for storing, using or handling any flammable gas (e.g. LPG or CNG or acetylene) in excess of 400 SCF. FDNY permit is also required to store, handle or use an asphalt melter.

For LPG, 400 SCF is approximately 47 lbs. The following table lists the number of LPG containers for the storage, use, handling or transportation, requiring a permit. This permit will be issued by the Fire Commissioner after the location has been inspected and approved as acceptable for such practices.

LPG Container Capacity	Number of Containers Requiring Permit
14.1 oz	54
16.4 oz	46
20 lbs	3
33.5 lbs	2
40 lbs	2
100 lbs	1

Portable **LPG** containers that are more than **16.4 oz** and **CNG** containers with a capacity greater than **8.7 SCF** must NOT stored, handled, or used indoors in the following occupancies (as defined in the Building code): residential occupancies, factory and industrial occupancies; educational occupancies; institutional occupancies, except as the commissioner may authorize by rule.

**Any single standard portable LPG container must not exceed 100 lbs in weight. Any single CNG container must not exceed 381 SCF.**

A LPG/CNG permit will not be issued by the FDNY for a stationary LPG/CNG installation located in an area where access to piped natural gas from a public utility is available.

Example of LPG container with a capacity of 20 lbs	Example of LPG container with a capacity of 100 lbs
	

**Types of FDNY Permits**

(1) Site-specific permit

Such permit authorizes the permit holder to store, handle, or use flammable gases, or conduct a torch operation at a specific premises or location. A site-specific permit may be a permanent permit or a temporary permit. Permanent permits are valid for 12 months only. Every permits or renewal shall require an inspection and shall expire after twelve months. Temporary permit may be valid from one day to 12 months depends on the construction /operation need. For example, a one-week temporary permit may be issued to a construction job which only takes one week. Normally, a hot work operation (e.g. construction site or hot work repair) is issued a temporary permit.

Example of a permanent FDNY permit

FIRE DEPARTMENT, CITY OF NEW YORK					BUREAU OF FIRE PREVENTION		
ACCOUNT NUMBER 7777777	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 345	SUB CODE 00	QTY 1	DESCRIPTION COMPRESSED GASES ONLY STR/LIFE			FLOOR NO 1	FEE PAID
PERMIT TYPE 1		ANNUAL FEE				PAID	
1-REGULAR 2-SUPPLEMENTAL 3-DUPLICATE		CARI & RENO 1111 YORK ST STATEN ISLAND NY 11111					
20 11012938		BY ORDER OF THE COMMISSIONER					

Example of a temporary FDNY permit

D.O.	COMPANY	BORO	ACCOUNT NO.	TOTAL FEE	PERMIT COVER
01		MANH	3333333	\$ 525.00	02.24.11
Expiration Date	THE CITY OF NEW YORK FIRE DEPARTMENT			PERMIT COVER	
11/24/11	Bureau of Fire Prevention 9 Metro Tech Center Brooklyn, N.Y. 11201-3857			CODE NO.	
F 02872	FIRE DEPARTMENT PERMIT			345 OXYGEN STORAGE & CONSTRUCTION SITE	
Postal Address of Permit Holder or Agent:	KARLIN PIPING INDUST 347 REN WAY WADING RIVER, N.Y., 11792			346 ACETYLENE STORAGE AT CONSTRUCTION SITE	
Occupancy for which this Permit is issued and at which it must be displayed:	13110 WEST 11 STREET NEW YORK N.Y., 10011			347 USE OXYGEN AND ACETYLENE TORCH AT CONSTRUCTION SITE	
New York	MANHATTAN			NOTE: OXYGEN AND ACETYLENE CYLINDERS SEPARATELY STORED IN APPROVED CAGES AT GROUND LEVEL	
<p>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.</p> <p>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.</p>					
 Fire Commissioner					
RF-101 (1/01) a3-111-R05-0470					
CASHIER'S COPY					

This temporary permit is valid for 7 months.

(2) Citywide permit

Such permit authorizes the permit holder to store, handle, use or sell hazardous materials, or conduct an operation on a citywide basis. A citywide permit is valid to temporarily store,

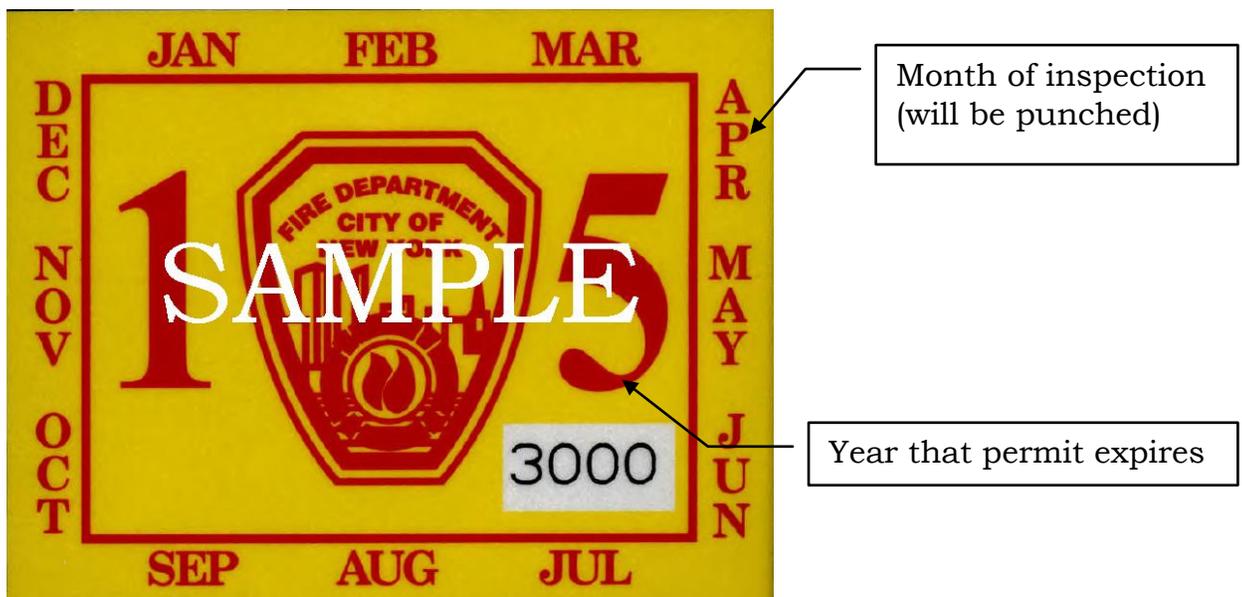
handle, use or sell hazardous materials or to conduct an operation at one or more locations subject to the following restrictions:

- The duration of such activity at any individual location does not exceed **30 calendar days** and **all hazardous materials associated with such activity are removed from the location at the end of the workday**. Periods of activity in excess of 30 calendar days at any one location shall require a site-specific permit.
- The quantity of hazardous materials being temporarily stored and used does not exceed 5 gallons of gasoline, or 250 gallons of any other flammable liquid, and 300 gallons of any combustible liquid. Storage or use of hazardous materials in quantities exceeding these amounts requires a site-specific permit for each location at which such storage or use occurs.

(3) Transportation permit

Such permit authorizes the permit holder to transport, pick up and deliver hazardous materials. Any person who transports any hazardous material in the quantity of requiring a FDNY permit has to apply for a FDNY transportation permit. The FDNY transportation permit (sticker) must be displayed on the vehicle.

Example of a FDNY transportation permit (a sticker)



All permits are not transferable, and any change in occupancy, operation, tenancy or ownership requires that a new permit be issued. The Certificate of Fitness holder is responsible for making sure that all fire safety regulations and procedures are obeyed on the premises. **Permits shall be readily available on the premise for inspection by Fire Department representatives.**

**Prohibitions**

**(1) Roofing prohibitions**

- An asphalt melter or any torch operation must not be used on a combustible roof.

- Tar kettles, asphalt melters and pots shall not be utilized indoors or on the roof of a building or structure, except that LPG-fueled asphalt melters may be utilized on the roof of a building or structure in accordance with the rules.

**(2) Prohibitions for LPG and CNG**

Store, handle or use LPG in any equipment used or previously used for natural gas is prohibited in New York City, except as may be authorized by the commissioner on an emergency basis. On the other hand, store, handle or use CNG in any equipment used or previously used for LPG is also prohibited in New York City, except as may be authorized by the commissioner on an emergency basis.

Description	LPG	Exception	CNG	Exception
Store, handle or use it in a basement, cellar or other <b>below grade area</b>	Prohibited	Emergency indoor Repairs (except in an occupied place of public assembly), manhole operation	Prohibited	Emergency indoor Repairs (except in an occupied place of public assembly), manhole operation
Store, handle or use it in, or bring it or allow it into, any residential occupancy, or on any lot containing a building used for a residential occupancy, or any non-residential building	Prohibited for any LPG container with a capacity greater than 16.4 ounces	Emergency indoor Repairs (except in an occupied place of public assembly)	Prohibited for any CNG container with a capacity greater than 8.7 SCF	Emergency indoor Repairs (except in an occupied place of public assembly)
<b>Store</b> the containers on the <b>roof</b> of any building	Prohibited		Prohibited	
<b>Handle or use</b> it on the <b>roof</b> of any building	Prohibited for any LPG containers with a capacity greater than 16.4 ounces.	Emergency indoor Repairs (except in an occupied place of public assembly)/Asphalt melter	Prohibited for any CNG containers with a capacity greater than 8.7 SCF	Emergency indoor Repairs (except in an occupied place of public assembly)/ Asphalt melter.
Store, handle or use it in or on <b>motor vehicles</b>	Prohibited	Temporary storage incidental to transportation, or as a fuel for generating motive power for a motor vehicle	Prohibited	Temporary storage incidental to transportation, or as a fuel for generating motive power for a motor vehicle

Description	LPG	Exception	CNG	Exception
Store, handle or use it for a stationary installation in any area where access to <b>piped natural gas</b> from a public utility is available, except as authorized by the commissioner.	Prohibited		Prohibited	
Store, handle or use it for <b>space heating or water heating</b>	Prohibited	Residentially occupied moored vessels	Prohibited	Residentially occupied moored vessels
Use <b>non-metallic pipe</b> , tubing and components	Prohibited	Construction sites, emergency indoor repairs, manhole operations	Prohibited	Construction sites, emergency indoor repairs, manhole operations
Dispense LPG/CNG, fill a container with LPG/CNG, or transfer LPG/CNG from one container to another	Prohibited		Prohibited	Fill the permanently mounted CNG containers on CNG-powered vehicles

The use of LPG/CNG and hot work operations are required to comply with the following FDNY code and rule sections:

- Welding and Other Hot Work: **[FC Chapter 26]**
- Flammable Gases: : **[FC Chapter 35]**
- Liquefied petroleum gases: **[FC Chapter 38]**
- Fire Prevention During Welding, Cutting and Other Hot Work: **[NFPA 51B, 2003 edition]**
- Compressed Natural Gas **[Rule 3507-01]**
- Liquefied Petroleum Gases **[Rule 3809-01]**

## DEFINITIONS

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**ASPHALT MELTER.** An approved device designed to heat asphalt, typically for waterproofing operations, that, utilizing a flammable gas or a combustible liquid, generates an enclosed flame that indirectly heats a vessel containing the asphalt.

**CNG.** Compressed natural gas.

**FLAMMABLE GAS.** A material which has a boiling point and becomes a gas at 68°F (20°C) or less at 14.7 pounds per square inch absolute (psia) (101 kPa) of pressure which:

1. Is ignitable at 14.7 psia (101 kPa) 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 (101 kPa) with air of at least 12 percent, regardless of the lower explosive limit, in accordance with testing procedures set forth in ASTM E 681.

**FIRE GUARD:** A person holding a Certificate of Fitness for such purposes, who is trained in and responsible for maintaining a fire watch and performing such fire safety duties as may be prescribed by the commissioner.

**FIRE WATCH:** A temporary measure intended to ensure continuous and systematic surveillance of a building or portion thereof by one or more qualified individuals for the purposes of identifying and controlling fire hazards, detecting early signs of fire, raising an alarm of fire, and notifying the department.

**HOT WORK:** Cutting, welding, thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, cadwelding, installation of torch-applied system, or any other similar operation or activity.

**HOT WORK AREA:** The area exposed to sparks, hot slag, radiant heat, or convective heat as a result of hot work.

**HOT WORK EQUIPMENT.** Electric or gas welding or cutting equipment used for hot work.

**HOT WORK PROGRAM.** A program, implemented by a responsible person designated by the owner of a building or structure in or on which hot work is being performed, to oversee and issue authorizations for such hot work for the purpose of preventing fire and fire spread.

**HOT WORK PROGRAM AUTHORIZATIONS.** Authorizations issued by the responsible person under a hot work program allowing welding or other hot work to be performed at the premises.

**LPG:** Liquefied Petroleum Gases.

**NFPA:** National Fire Protection Association. NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks.

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

**RESPONSIBLE PERSON:** A person trained in the fire safety hazards associated with hot work, and in the necessary and appropriate measures to minimize those hazards, who is designated by the owner of a premises to authorize the performance of hot work at the premises.

**SCF:** Standard Cubic Feet.

**TAR KETTLE.** A device designed to heat tar, asphalt, pitch or similar materials, typically for waterproofing operations, that, utilizing a flammable gas or a combustible liquid, generates a flame to heat a vessel containing such a material. Tar kettle does not include asphalt melters.

**TORCH-APPLIED ROOF SYSTEM:** Bituminous roofing systems using membranes that are adhered by heating with a torch and melting asphalt back coating instead of mopping hot asphalt for adhesion.

## PART 1. TORCH (HOT WORK) OPERATION

The torch flame can reach extremely high temperatures to heat the material. However, usually it is not the flame that causes a fire. Instead, **it is the thousands of sparks and slag that are generated when using the torch.** The sparks and slag are the sources of ignition in about 60% of all fires in industrial occupancies. This number is greatly reduced when the operators are trained to use the equipment correctly.

### Fire History Summary

Date	Fire Summary	Lessons Learned	
Nov. 2010	<p><u>Chinese city of Shanghai construction fire</u> Sparks from welding equipment set a light nylon construction netting and bamboo scaffolding that nearly covered the building. 58 people died and 56 still missing, and more than 120 are injured.</p>	<p>There should be a safe distance between the combustible materials (in this case the bamboo scaffolding) the hot work operations area, or there should be a fire guard watching for sparks.</p>	
July 2009	<p><u>Throgs Neck construction fire, Queens, NY</u> At 5 a.m. a fire started near scaffolding and flammable construction materials on the Queens-side bridge approach by a construction worker's blow torch.</p>	<p>Although still under investigation, the cause reflects a lack of fire safety at the construction site.</p>	
June 2009	<p><u>5-story apartment construction fire, Renton, WA</u> Several spot fires from a roof torch had fallen into the void between the insulation, ceiling, and roof assembly, and a breeze provided enough air for a fire to flare up early hours later. The fire spread rapidly through the wooden construction. \$12 million damage estimate in this fire.</p>	<p>Sheetrock had not yet been installed to protect the wood framing. There should be a fire guard watching for sparks.</p>	

Date	Fire Summary	Lessons Learned	
Mar. 2009	<p><u>Casino Fire, Joliet, IL</u> A fire sparked by a construction worker welded a kitchen hood in an area of the casino. The fire caused heavy damage to sections of the Empress Casino and firefighters had to truck in water to contain the blaze. \$340 million damage estimate in this fire.</p>	There should be a fire guard watching for sparks.	
Dec. 2000	<p><u>Dongdu Commercial Building construction, Luoyang, China</u> Construction workers in the basement dropped molten metal on flannel rags and wooden furniture. The welders fled without warning, and workers on 2<sup>nd</sup> and 3<sup>rd</sup> floor, as well as 200 guests at an illegal party, were trapped. 309 people died.</p>	Only 60 escaped the fire, as construction material and merchandise blocked exits. Firefighters used cranes to attempt rescues, and the fire took 3 hours to extinguish. The welders who started the fire were performing unlicensed renovation work.	

### **Sources**

Arnold, Jim. "Large Building Fires and Subsequent Code Changes". April 7, 2005.  
 FDNY: Worker's blow torch started Throgs Neck fire. (2009, July 13). *Newsday*.  
 Small Fire causes damage at hospital construction site. (2010, February 16). *Daily Sound*.  
 Stephen G. Badger. "US Large-Loss Fires in 2009". (2010, November/ December). *NFPA Journal*.

Fire watch is to oversee torch operations. This fire watch person ensures that sparks and slags do not cause a fire in the area of hot work or the floor below if required. A portable extinguisher must be within immediate reach to extinguish any potential fire situation.

### **1.1. Approved Location and Restricted Areas**

#### **1.1.1. Hot Work Approved Areas**

Hot work may be conducted in the following areas:

1. Areas designed for hot work operations (e.g. jewelry factory).
2. Areas authorized for that purpose by the responsible person at the premises when precautions have been taken in compliance with the requirements of Fire Code (e.g. areas with hot work authorization).

#### **1.1.2. Restricted Hot Work Areas**

Hot work must not be conducted in the following areas:

1. Areas where the sprinkler system is impaired.
2. Areas where there exists the potential of an explosive atmosphere, such as locations where flammable gases, liquids or vapors are present.
3. Areas with readily ignitable materials, such as storage of large quantities of bulk sulfur, baled paper, cotton, lint, dust or loose combustible materials.
4. On board marine vessels or watercraft at dock under construction or repair.

## **1.2. Responsible Person and Pre-Hot Work Check**

For hot work operation with citywide permit, the owner of the premises of the hot work operation areas must be notified in writing by the citywide permit holder **at least 48 hours before** the hot work is to be started.

For all hot work operations, the owner of the hot work operation areas must designate a responsible person. The responsible person must ensure that the hot work is performed in compliance with the terms and conditions of the permit. The person should inspect the hot work site prior to issuing the hot work program authorization to ensure that it is a fire safe area. He/she also need to periodically monitor the work as it is being performed to ensure there are no fire safety hazards. Hot work operations must be conducted under the general supervision of the responsible person.

Before hot work is authorized and at least once per day while the authorization is in effect, the hot work area shall be inspected by the responsible person to ensure that it is a fire safe area.

**The pre-hot work check must be conducted by the responsible person before hot work is authorized and at least once per day.** The check reports must be kept at the work site during the work, made available for inspection by a representative of the FDNY, and **maintained on the premises for a minimum of 48 hours after work is complete.**

**A pre-hot work check must be conducted at least once per day** and must verify the following:

1. The hot work equipment is in good working order.
2. The hot work area is clear of combustibles and flammable solids.

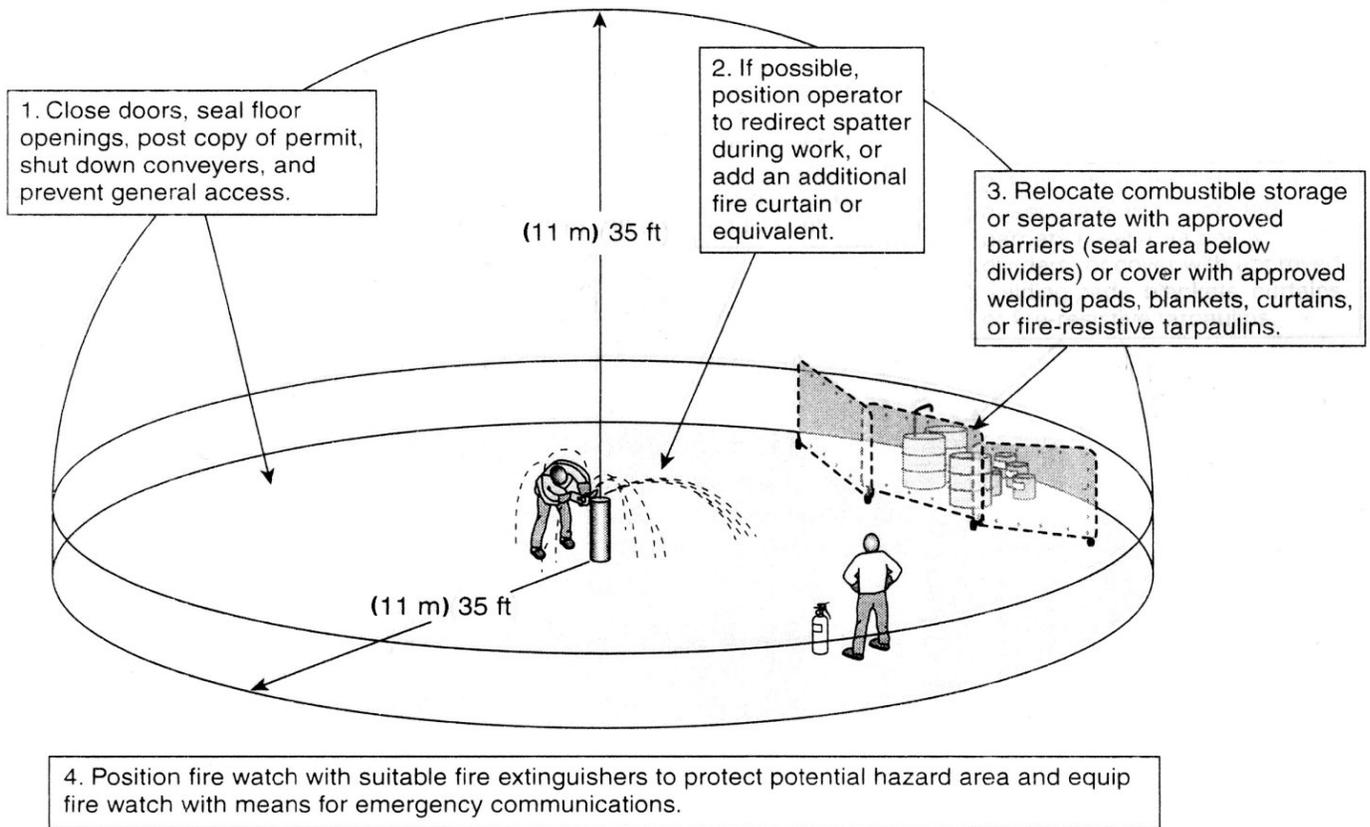
### (1) 35 feet rule for cutting or welding operation

Hot work operations involving cutting or welding shall be conducted at least 35 feet from combustible materials and combustible waste or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

### (2) 25 feet rule for other hot work operation

All other hot work operations shall be conducted at least 25 feet from combustible materials and combustible waste or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

The 2009 edition of National Fire Protection Association 51B shows the 35-ft. rule in a 3-D perspective. Detail information refer to Chapter 5 of NFPA 51B, 2009.



3. Exposed construction is of noncombustible materials or, if combustible, is protected.
4. Openings are protected.
5. Hot work area floors are clear of combustible waste accumulation.
6. Fire watch personnel, where required, are assigned.
7. Approved actions have been taken to prevent accidental activation of fire extinguishing systems and detection equipment.

(1) Sprinkler protection.

Sprinkler system protection **must not be shut off or impaired** while hot work is performed. Where hot work is performed close to sprinklers, noncombustible barriers or damp cloth guards shall shield the individual sprinkler heads and shall be removed when the work is completed. If the work extends over several days, the shields shall be removed at the end of each workday.

(2) Fire detection systems.

Approved precautionary measures shall be taken to avoid accidental operation of automatic fire detection systems. For example, the fire alarm system (e.g. smoke detectors) may need to be taken out of service during the hot work operation to avoid unwarranted alarms. The date and time the alarm system was taken off-line, the reason for such action, the name and operator number of the person notified at the central station (or other evidence of notification satisfactory to the Department), and the date and time the system was restored to service, must be entered in the alarm log book in each such circumstance. Fire watch for impairment must be provided when the alarm system is off-line.

9. Portable fire extinguishers and fire hoses (where provided) are operable and available.

10. All persons performing hot work possess certificates of fitness, where such certificates are required.
  - (1) G-60 certificates of fitness is required for torch operations using oxygen and a flammable gas
  - (2) G-60 or G-41 or G-42 certificates of fitness is required for torch applied roofing system.
  - (3) F-60 certificates of fitness fire guard is required to perform the fire watch for torch operations at (a) construction sites, (b) on any rooftop, or (c) in any building or structure, when the torch operation is conducted by a person holding a citywide permit for torch operations
11. All persons performing hot work requiring a permit possess a site-specific permit or citywide permit, authorizing such work.

### **1.3. Hot Work Program Authorization**

A hot work program authorization is required for any project conducted on premises involving hot work operations. Hot work authorization must be signed and issued by the responsible person, and it must be available for inspection by any representative of the department during the performance of the work, and for **48 hours after the work is complete**.

An authorization for hot work operations shall not be issued unless the individuals conducting such operations are capable of performing such operations safely.

An example of a hot work program authorization is shown on the following page.

# HOT WORK PROGRAM AUTHORIZATION

This authorization is required for any project conducted on premises involving hot work operations. Hot work operation includes cutting, welding, thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, cadwelding, installation of torch-applied roof systems or any other similar operation or activity.

An authorization for hot work operations shall not be issued unless the individuals conducting such operations are capable of performing such operations safely.

**This authorization shall be available for inspection by any FDNY representative during the performance of the work and for 48 hours after the work is complete.**

Date: _____	Hot work by <input type="checkbox"/> employee <input type="checkbox"/> contractor
Location: Building address, room # and/or area of work: _____ _____	Work to be done _____ _____
Time started _____ Time completed _____	I verify that the above location has been examined, the pre-hot work checks marked on the checklist below have been taken and permission is granted for this work.
<b>THIS AUTHORIZATION GOOD FOR ONE DAY ONLY</b>	Name (print) and signature of the responsible person: _____

The hot work equipment is in good working order.

The hot work area is clear of combustibles and flammable solids:

(35 Feet rule for cutting or welding operation; 25 feet rule for other hot work operation)

- Any container or equipment that contains or has contained a flammable solid, flammable liquid or flammable gas is removed.
- Explosive atmosphere in area eliminated
- Any combustible material and combustible waste is removed or be provided with appropriate shielding.

Exposed construction is of noncombustible materials or, if combustible, is protected.

Openings are protected.

Hot work area floors are clear of combustible waste accumulation.

Fire watch personnel, where required, are assigned.

Fire guard (Name and signature) : \_\_\_\_\_ Cof # \_\_\_\_\_ Exp Date: \_\_\_\_\_

Approved actions have been taken to prevent accidental activation of fire extinguishing systems and detection equipment.

- Available sprinklers are in service and operable. Sprinkler system protection must not be shut off or impaired.
- Approved precautionary measures shall be taken to avoid accidental operation of automatic fire detection systems.
- Portable fire extinguishers and fire hoses (where provided) are operable and available.

All persons performing hot work possess certificates of fitness, where such certificates are required

Torch operator (Name and signature) \_\_\_\_\_ Cof # \_\_\_\_\_ Exp Date: \_\_\_\_\_

All persons performing hot work requiring a permit possess a FDNY permit, authorizing such work.

### Final Check

Work area and all adjacent areas to which sparks and heat might have spread were inspected 30 minutes after the work was completed and were found fire safe.

Fire guard (Name and signature) : \_\_\_\_\_ Cof # \_\_\_\_\_ Exp Date: \_\_\_\_\_

Second inspection for torch operation using LPG/CNG: work area and all adjacent areas were inspected 1 hour after the work was completed and were found fire safe.

Fire guard (Name and signature) : \_\_\_\_\_ Cof # \_\_\_\_\_ Exp Date: \_\_\_\_\_

## **1.4. Fire Safety Requirements**

### 1.4.1 Gas Torch Operation Precautions

Each person must operate only one torch at a time and such torch must not be left unattended while ignited.

The torch equipment should only be used for purposes for which it was intended. It should not be used for any kind of tricks or stunts. This could result in serious or fatal injuries.

### 1.4.2 Protection of Combustibles

Areas designed for hot work operations shall have floors with noncombustible surfaces. Paper, wood shavings, straw and fabric are examples of combustible materials. Hot work operations involving cutting or welding shall be conducted at least 35 feet from combustible materials and combustible waste or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

All other hot work operations shall be conducted at least 25 feet from combustible materials and combustible waste or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

Combustible waste shall not be allowed to accumulate on floors and other surfaces within the hot work area. Hot work areas shall be regularly cleaned and combustible waste removed and disposed of lawfully.

If possible, the combustible materials should be moved to a safe location. If relocation of the combustible materials is impractical, combustibles, openings or cracks in walls, floors, ducts or shafts within 35 feet of the hot work area must be tightly covered to prevent the passage of sparks to adjacent combustible areas, or shielded by metal or fire-retardant guards, or provided with curtains to prevent passage of sparks or slag. They may also be wetted down as an added precaution. Ducts and conveyor systems that might carry sparks to distant combustibles must be shielded, or shut down, or both. If hot work is done near walls, partitions, ceilings, or roofs, ignition of combustibles on the other side must be prevented.

It is prohibited to perform welding or cutting when supported by or resting on any compressed gas containers. Hot work shall not be performed on a container or equipment that contains or has contained a flammable solid, flammable liquid or flammable gas until the container or equipment has been thoroughly cleaned and purged. Hot work involving cutting, welding or heating of any flammable solid in any form shall be conducted only with an approval of the FDNY.

Partitions segregating hot work areas from other areas of the building shall be of noncombustible construction. In fixed hot work areas, the partitions shall be securely connected to the floor such that no gap exists between the floor and the partition. Partitions shall prevent the passage of sparks, slag, and heat from the hot work area.



**Special requirement for a repair garage:**

The use of a torch within a repair garage located on a property upon which a motor-fuel dispensing facility is situated must be conducted within a fire-rated enclosure. All doors of such enclosure shall be fireproof and self-closing.

In a repair garage with a capacity for more than one vehicle, hot work shall be conducted within a fire-rated enclosure or behind a noncombustible screen that is positioned and of sufficient size to prevent the passage of sparks, slag and heat from the hot work area.

1.4.3 Signage

Where the hot work area is accessible to persons other than the operator of the hot work equipment, visible hazard identification signs must be posted in a conspicuous location to warn others before they enter the hot work area. An example warning sign is shown below.



A copy of the FDNY permit and hot work authorization are to be kept by the fire guard or the person who performs the fire watch. Copies of completed permits will be maintained in the project files. All hot work authorizations must be returned to the responsible person upon completion of work for the day to confirm that work in the area has been concluded. This returned authorization must be filed with the FDNY hot work permit section with the appropriate original.

**1.5. Fire Watch Requirements**

1.5.1. Fire watch

**A fire watch must be maintained during any hot work operation.** The fire watch shall observe the entire hot work area. Hot work conducted in areas with vertical or horizontal fire exposures that are not observable by a single individual shall have additional personnel assigned to ensure that exposed areas are monitored.

Persons conducting a fire watch shall keep constant watch for fires with respect to the areas being monitored in connection with hot work operations. **The persons conducting a fire watch shall not have other duties.**

Where hose lines are required, they shall be connected, charged and ready for operation. At least one portable fire extinguisher with a minimum **2-A:20-B:C** rating shall be provided and readily accessible within a **30 feet** travel distance of the location where hot work is performed and where the fire guards are positioned.

Exception: **There shall be not less than one multi-purpose portable fire extinguisher with a minimum 3-A 40-B:C rating for roofing operations utilizing heat-producing systems or other ignition sources.**

#### 1.5.2. Fire guard

**The fire watch for torch operations conducted at the following three locations shall be conducted by at least one F-60 fire guard:**

- (1) Construction sites.**
- (2) In any building or structure, when the torch operation is conducted by a person holding a citywide permit for torch operations.**
- (3) On any rooftop, or in connection with any torch-applied roofing system operation.**

**It is important to understand the code-required distinction between a fire watch and a fire guard. Not all individuals responsible to maintain a fire watch must possess an F-60 certificate of fitness.**

#### 1.5.3. Fire guard for construction sites and torch-applied roofing systems

It shall be unlawful to install any roofing material using a torch on a roof of combustible construction, or otherwise engage in roofing operations on roofs of combustible construction using hot work equipment.

A torch-applied roof system is a bituminous roofing system using membranes that are adhered by heating with a torch and melting asphalt back coating instead of mopping hot asphalt for adhesion. It is widely used in US, torch-applied operations can be hazardous to roofers and the public. Improper torch use or careless fire watch has caused many rooftop fires. Fire guards must be on continuous duty during all torch operations on the roof of a building.

At a construction site and torch-applied roofing system operation, every torch operator must also have a person performing fire watch by a F-60 fire guard.

Exception:

The single fire guard may be designated to conduct a fire watch for more than one torch operation on the same floor or level if each torch operation is not more than 50 feet from the fire guard, as measured by the actual path of travel, and the field of view of such fire guard encompasses all of the horizontal fire exposures of such torch operations.

**Fire watch on floors below:** Additional F-60 fire guard is required to perform fire watch on floor below if the torch operation is being conducted at or near the edge of an unenclosed floor of a building, or near a floor opening, or other location where sparks and slag may travel to one or more lower floors or levels.



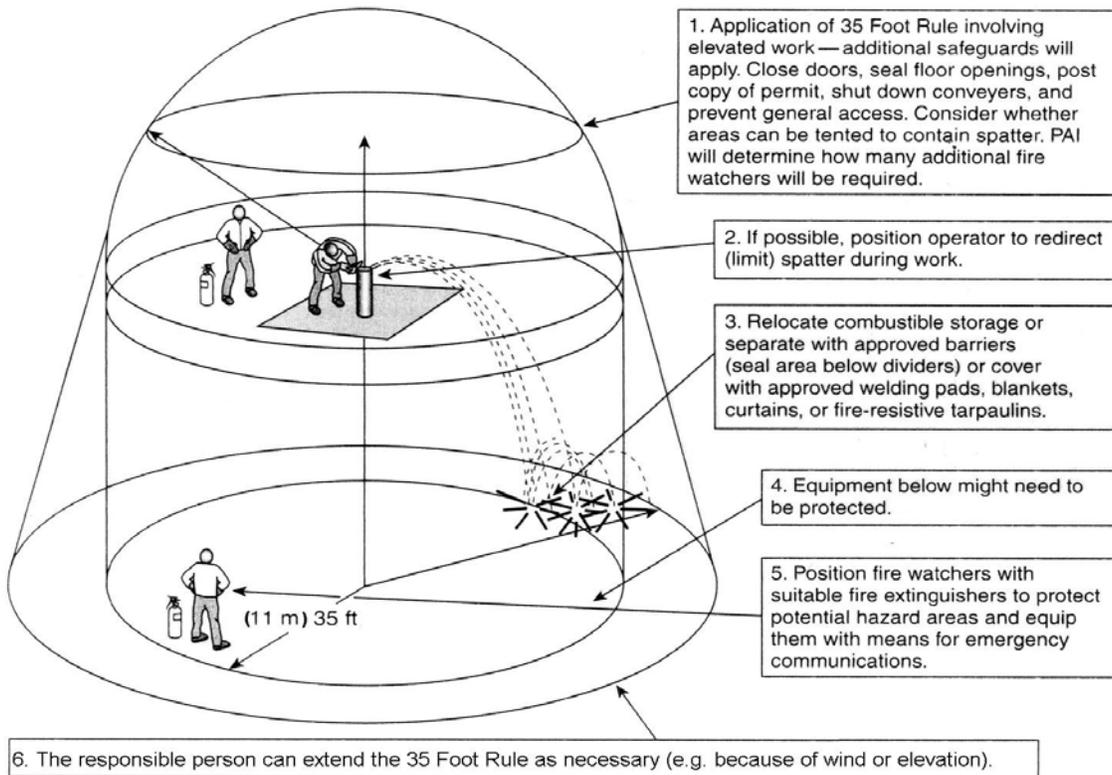
Fire watch is required for adjoining areas and below to make sure that sparks do not cause a fire on the adjoining areas.

This additional fire guard must conduct a fire watch on each lower floor or level containing combustible surfaces or materials within 35 feet of the area of such floor or level that potentially would be exposed to such sparks or slag. Prior to commencement of the torch operation, the fire safety manager or responsible person shall inspect the lower floors or levels and take all necessary and appropriate precautions to protect any combustible surfaces and materials that potentially would be exposed to sparks and slag from the torch operation. A certification to that effect must be made on the hot work authorization.

**Exception:**

1. A fire watch is not required on the floors/levels below a torch operation on a construction site when ALL the following conditions are met:
  - 1.1. the torch operation is not being conducted at or near the edge of an unenclosed floor of a building;
  - 1.2. the floor upon which the torch operation is being conducted is of noncombustible construction;
  - 1.3. there are no floor or exterior building openings within 35 feet of the torch operation; AND
  - 1.4. prior to commencement of the torch operation, the fire safety manager or responsible person conducts an inspection and takes the precautions to protect any combustible surfaces and materials that potentially would be exposed to sparks and slag from the torch operation.
2. Notwithstanding the foregoing exception, if sparks or slag generated by the torch operation are observed to extend beyond 35 feet, thereby potentially exposing lower floors or levels, the torch operation shall be immediately discontinued, and the floors or levels below shall be inspected for any fire condition. If there is any potential exposure surfaces or materials on the floors below from such sparks and slag, noncombustible barriers shall be provided and any other necessary or appropriate precautions shall be taken. If such barriers and precautions fail to block the passage of sparks and slag, a fire watch shall be established on the floors or levels below.

The 2009 edition of National Fire Protection Association 51B shows the 35-ft. rule in a 3-D perspective to account for multiple fire watchers. Detail information refer to Chapter 5 of NFPA 51B, 2009 .



#### 1.5.4. Time and Recordkeeping requirement

For any CNG or LPG torch operation, **the first inspection shall be conducted 30 minutes after completion of torch operations; the second inspection 1 hour after completion of torch operations.** This is to make sure that there are no smoldering fires in the building. The fire guards must complete a signed inspection report. The fire guards or fire watch personnel must complete a signed inspection report (or the log book). **This report must be submitted to and retained by the person in charge of the torch operations.** The inspection report must be made available to any representative of the Fire Department and should be maintained on the premises for reasonable length of time (e.g. 48 hours) after work is complete.

## PART 2. GAS TORCH EQUIPMENT

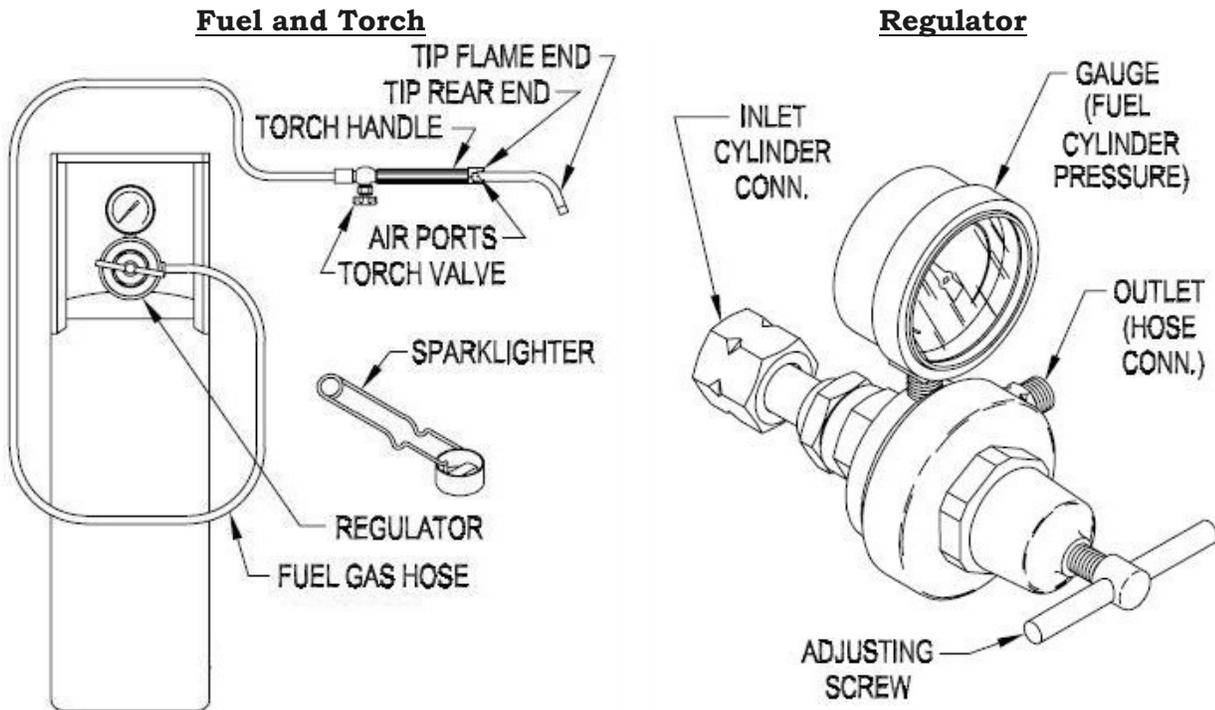
Gas torches are widely used for different purposes citywide. A fuel gas is used in the equipment to generate a flame to perform heating, cutting welding and brazing. A gas torch utilizing flammable gas only is usually blowtorches (air-fuel) or single tank torch. All torches and tips that utilize a flammable gas for hot work operations must be listed.

### Example of blowtorch (air-fuel)



### 2.1 Blowtorch (Air-fuel) or single tank torch

A propane torch is an example of a blowtorch, commonly used in torch-applied roof system. To provide enough oxygen for the torch to burn the fuel cleanly, the system mixes in air from the surrounding environment prior to ignition and while the torch is running. A container holds the fuel, while a tube carries it up to the nozzle. A valve near the nozzle lets in the air as needed.



Most common fuel gases used in blowtorches are LPG (e.g. butane, propane), natural gas (methane) (either CNG or piped natural gas).

The fuel gas (e.g. propane, natural gas or acetylene) is stored at higher pressures to keep a sufficient amount of fuel available for torch operations. However, it is dangerous to use the fuel gas at pressures above 15 psi, especially for acetylene. For this reason, a regulator is installed on the fuel cylinder. The regulator makes sure that the fuel is discharged from the gas container at a safe pressure range.

## 2.2 Different Use of Single Tank Gas Torches

### 2.2.1 Heavy duty application

Gas torches also have applications for burning weeds, melting ice, or applying tar/asphalt to a roof. The flame is often a diffuse high temperature naked flame. The temperature can exceed 2000°F.



Use	Temperature	Sample Picture
Heavy Duties	Wild range	<p>control valve</p> <p>turbo blast trigger</p> <p>torch head</p>

## 2.3 Common Problems Occur With Torch Operations

### 2.3.1 Backfire

This occurs when the flame on the torch goes out unexpectedly. A loud snap or pop may occur when the flame goes out. Sometimes the flame will quickly relight. This happens when the working surface area is hot enough to re-ignite the flame. Backfire may be caused

by several things that are easy to fix. The following is a list of some conditions that might cause backfire.

- (1) Touching the nozzle tip against the working surface.
- (2) Overheating the nozzle tip.
- (3) The oxygen and/or the fuel gas is set at the wrong pressure.
- (4) The cutting or welding tip is loose or dirty.
- (5) Dirt on the work surface.
- (6) Kinks or blockages in the hoses.
- (7) The nozzle tip is damaged and not seated properly in the torch head.

If backfire is noticed the container valves should be closed and the equipment checked for the symptoms listed above. If any dirt or damage is noticed, it should be cleaned or repaired before the equipment is used again.

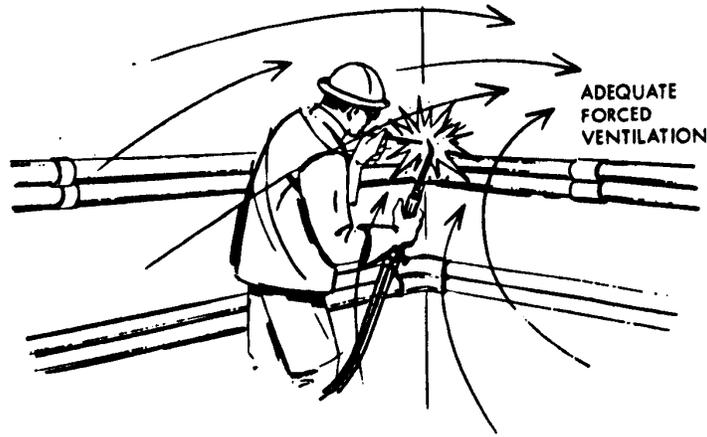
### 2.3.2 Flashback

This occurs when the cutting or welding flame burns inside the torch or the hoses. It is usually accompanied by a whistling or hissing noise. As soon as the hissing or whistling is noticed the torch control valves should be closed. Then the fuel gas container valve should be closed. This allows the flame to burn itself out. After a few minutes the fire should have burned itself out.

Flashback indicates that there is something seriously wrong with the equipment. The equipment should be checked for damage or blockage. Check for the same conditions that might cause backfire. A build up of dirt may also cause the flashback. This can be a very dangerous situation. Care should be taken to make sure that it is fixed properly. If the equipment is not cleaned and repaired correctly it may result in an explosion. The entire system should be cleaned and repaired if needed. If the flashback happens again, a qualified technician should repair the equipment.

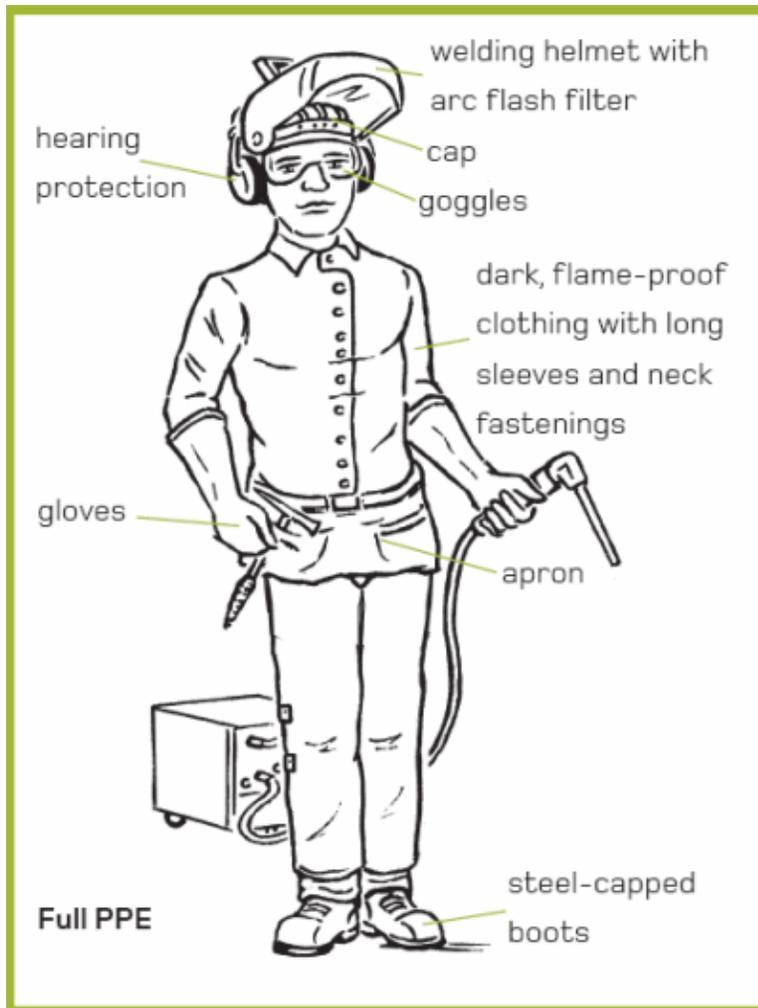
## **2.4 Personal Protection**

The gas-torch equipment should only be used by trained and responsible personnel. Only the equipment approved by the Materials and Equipment Acceptance (MEA) should be used. The work area should be well ventilated. This will prevent the worker from breathing dangerous fumes. Exhaust fans may be used to draw the fumes away from the work area. An example of a well ventilated work area is shown below.



**A Well Ventilated Work Area**

The workers should wear flame resistant gloves and aprons, skull caps, helmets or goggles, and safety shoes. Clothing with pockets or cuffs should not be worn while working. Sparks or slag might catch in the cuffs or pockets. The following picture shows the appropriate safety clothing to wear while cutting and welding.



Frayed clothing is particularly susceptible to ignition and burning and should NOT be worn when welding or cutting.



**Protective Clothing to be Worn While Cutting and Welding**

## **PART 3. COMPRESSED GAS CONTAINER**

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The gases used by gas torches are commonly supplied in compressed gas containers, which can pose additional handling and transport hazards. All compressed gases are potential hazards because of the pressure within the container, their flammability, and/or their toxicity. The chemical is in gaseous form and pressurized, it can quickly contaminate a large area in the event of a leak.

### **3.1 Handling, Use, and Storage of Compressed Gas**

#### 3.1.1 General Guidance

##### (1) Label all compressed gas containers clearly

The contents of any compressed gas container must be clearly identified. 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.**

Several LPG markings are made by stamping, embossing, or using self-adhesive stickers or by spraying onto a form. They may be placed on the flowing parts or their combinations: collar, neck, base, body or a steel plate welded onto the container. LPG Container must be marked with the water capacity of the container in pounds and the tare weight (weight of the container with the valve and surface finish) in pounds. Normally, LPG containers are also marked with the manufacturer's mark; DOT identification number; serial number assigned by the manufacturer; date of the first test (month/year or month-year , e.g. 05/2007 or 5-07); date of the first periodical test. In addition to markings, warning labels must be applied to all LPG containers of 100 lb capacity or less that are not filled on site and they must include information on the potential hazards of LPG.

##### (2) Do not refill container

The gas containers must be replaced when they are empty. It is illegal to refill gas containers in New York City. **Empty containers must be handled in the same manner as full ones.** They should be marked empty, the container valve or regulator tap must be closed and stored separately from full containers. All empty containers must be promptly removed by vendors. Damaged or otherwise unusable LPG/CNG containers must be promptly removed from the premises and lawfully disposed of.

##### (3) Upright position

**All LPG/CNG containers must be secured in an upright position and must not be stacked or stored on shelves.** The gas containers should be maintained in an upright position when being used. The gas containers used for on-sites jobs are usually secured on a handtruck. The containers are less likely to be damaged when secured to a handtruck. The handtruck permits the gas containers to be moved safely. All gas containers must be secured from tipping over, and should be stored in an upright position, and be equipped with a pressure regulator designed for the specific gas and marked for its maximum container pressure. You can use appropriate material, such as chain, plastic coated wire cable, commercial straps, etc., to secure gas containers.

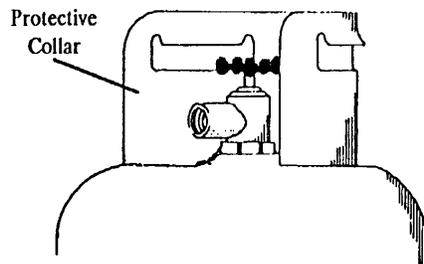
#### (4) Well-ventilated areas

Indoor compressed gas storage and compressed gas use areas must be located in well-ventilation areas. LPG/CNG containers shall not be used in a cellar, basement, pit or other area below grade. LPG containers shall not be used in an above-grade under floor space or basement unless such location is provided with an approved means of ventilation.

**Exceptions:** Portable LPG containers are allowed to be used to supply approved self-contained torch assemblies. Such containers shall not exceed 16.4 ounces of LPG.

#### (5) Always replace the protective cap

Most gas containers have a protective cap, LPG containers have a collar. These devices protect the container control valve from physical damage. The protective cap is shaped like an inverted cup. It is screwed on top of the gas container. It must be in place when the gas container is not in use. The protective collar is welded onto the top of the container. The collar extends above the height of the containers control valve. An example of a container with a protective collar installed is shown below.



**A Typical Protective Collar**

#### (6) Away from Temperature and Physical Damage

**All gas containers and the related equipment must be protected from extreme temperature and physical damage.** For example, gas containers for temporary stationary service must be placed on firm and non-combustible foundation. High temperatures (e.g. above 125 °F) can cause the pressure inside the container to increase to a dangerous level. A protective partition must be used to shield the containers that are exposed to hot air blown by a heating appliance. **All containers must be secured in an upright position, and must not be stacked or stored on shelves.**

#### (7) 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 services, repaired and tested by an authorized person.

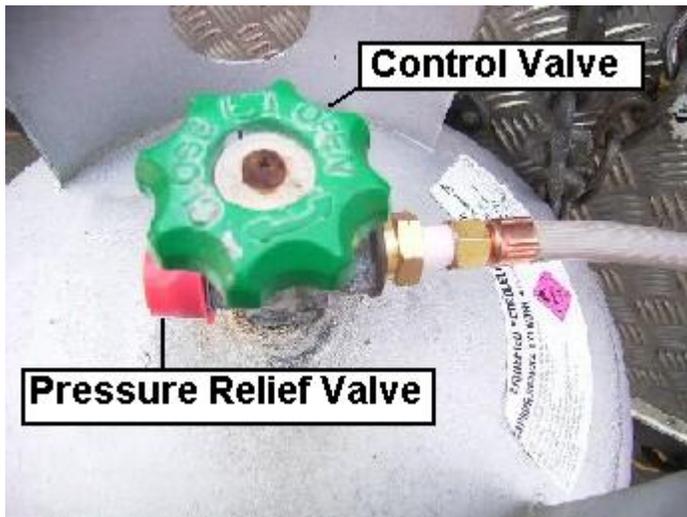
Quick visual check of compressed gas containers:

- No extreme denting, gouging, or corrosion is on the compressed gas container.
- The container protective cap/collar and the foot ring are intact and are firmly attached.
- The container is painted or coated to minimize corrosion.
- The container pressure relief valve indicates no visible damage, corrosion of operating components, or obstructions.
- There is no leakage from the compressed gas container.
- The container is installed on a firm foundation and is not in contact with the soil.

### 3.1.2 Related Equipment

#### (1) Control valve and pressure relief valve

A control valve is 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 simply turned to open most gas control valve. **The control valve must be opened by hand.** Container valves shall be closed before moving a gas container, when the torch is not in use, and when the gas container is empty.



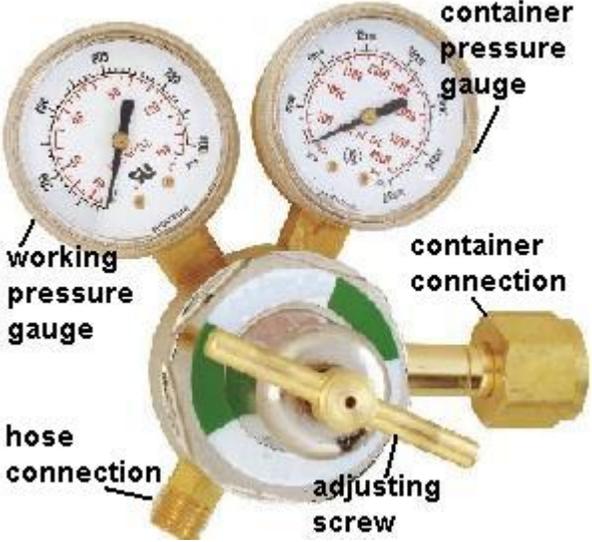
The **pressure relief valve** opens to allow the LPG to escape into the atmosphere when the pressure is too great in the container. This is a safety mechanism to prevent an explosion caused by the pressure build-up in the container. The relief valve or its discharge system must be designed to minimize the possibility of the entrance of water or dirt. If you observe or hear any gas leak from the pressure relief valve, call 911 immediately.

#### (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. The purpose of the regulator is to control the flow of gas and lower the pressure from the container to the appliance. The regulator not only acts as a control regarding the flow and distribution of gas, but also as a safety barrier between the high pressure of the gas container and the end use appliance.

Always select the regulators recommended by the manufacturer. Do not interchange regulators between different sizes/types of container without consulting the manufacture. **Do not open the gas container valve or regulator tap until the regulator is securely attached.** Regulator connections to gas container valves must be completely free of dirt, dust, oil, and grease. The regulator controls the discharge rate of gas from the container.

Examples of typical regulators are shown below.

<p>A Typical Regulator of LPG Container</p> 	<p>A Typical Regulator of Acetylene Container</p> 
<p>A Typical Regulator of CNG Container</p> 	

(3) Hose, Piping and Tubing

The regulator is also connected to a hose that supplies the gas to the appliance. This hose must be securely connected to the appliance. A rubber slip connection is prohibited. Only DOT approved hoses designed for a working pressure of 350 psi. are allowed. Generally speaking, nonmetallic pipe, tubing and components for any installation, appliance or equipment using LPG or CNG is prohibited. However, nonmetallic hose may be allowed at construction sites. **Hoses must be as short as practical protecting from mechanical injury**, but they must not be too close to an open flame. Hoses must be protected from physical damage and no hose is allowed to exceed 30 feet. When the gas containers are used inside buildings, the hose must not pass through any partitions, walls, ceilings, or floors. (NFPA 58 6.20.3.2)



This is designed for a rubber slip which is prohibited.

Piping in systems must be run as directly as is practical from one point to another, with as few fittings as practical. The use of nonmetallic pipe tubing, or hose for permanently interconnecting gas containers is prohibited. All piping and tubing must be protected against damage by vehicles and by corrosion-causing substance.

### 3.1.3 Moving Compressed Gas Containers

**A compressed gas container must not be rolled on its side or its rim.** It must be moved only by using approved lifting equipment. Containers must never be dropped or thrown from any height. Before transporting any compressed gas containers make sure that the valves are tightly closed.

Compressed gas containers should be moved in an upright position, and must be moved using an approved method. Where containers are moved by hand cart, the hand truck or other mobile device must be designed for the secure movement of containers. Carts and trucks utilized for moving compressed gas containers outdoors must be designed so that the containers will be secured against dropping, or otherwise striking against each other or other surfaces. Ropes, chains or slings must not be used to suspend compressed gas containers unless such containers have been designed for such handling. Valves of compressed gas containers must not be used for lifting.



acceptable

Unacceptable

1. Compressed gas container should be used, handled, and stored in upright position, except those designed for use in a horizontal position.
2. Compressed gas containers placed on carts and trucks must be individually restrained.

Compressed gas containers must be moved using an approved method.

If the compressed gas containers need to be transported between different floors, if possible use an elevator (e.g. freight elevator, construction elevator, or passenger elevator when approved), and such elevator shall be occupied by the minimum number of persons.

All compressed gas containers may be transported only in approved vehicles. A FDNY transportation permit issued by the Bureau of Fire Prevention is required for each vehicle transporting quantities exceeding 400 SCF of any flammable gas (e.g. LPG/CNG). Compressed gas containers may be delivered only to sites displaying a permit or Letter of Authorization issued by the Fire Commissioner.

### 3.1.4 Separation from hazardous conditions

The CNG and LPG gases container storage must be located away from the following: Electric power lines; Piping containing flammable or combustible liquids; Piping containing flammable gases; and Piping containing oxidizing materials.

All compressed gas containers and systems in storage or use shall be away from materials and conditions that present potential hazards to them or to which they present potential hazards. It is recommended to group containers according to the type of gas or whether containers are full or empty, if they are stored at the same location. **Fuel gas containers in storage must be separated from any combustible materials by a minimum distance of 20 feet.**

Generally, the compressed gas containers shall be kept away from

- Sources of ignition
- Temperature extremes (Above 125 °F or less than mean low atmospheric temperatures)
- Corrosive chemicals or fumes
- Falling objects
- Public tampering
- Ledges, unprotected platforms, and elevators or other areas where the container could drop a distance exceeding one-half the height of the container

### 3.1.5 Storing Containers

A permit is required for any storage area storing any flammable gas (e.g. LPG or CNG or acetylene) in excess of 400 SCF.

The storage of compressed gases in quantities requiring a permit shall be under the general supervision of a proper certificate of fitness holder.

Gas Types	Certificate of Fitness
LPG or CNG only	G-44
Acetylene or other flammable gases (not including LPG/CNG)	G-98

## 3.2 GENERAL DESCRIPTION OF LIQUID PETROLEUM GAS (LPG)

Liquefied petroleum gas (LP Gas or LPG) is often used as a fuel source. LPG includes propane, propylene, butane, and butylene. The most commonly used LPG is butane and propane. LPG is often referred to as "Bottled Gas". LPG is used in domestic, commercial, agricultural, and industrial settings. For example, propane is commonly used for domestic heating, cooking, and fuel for forklifts. Unless otherwise specified, the storage of LPG in quantities requiring a permit shall be under the general supervision of a person holding a Certificate of Fitness.

### 3.2.1 Description of Liquid Petroleum Gas

Manufacturing LPG is prohibited in NYC. **LPG is naturally colorless and odorless.** It is given an odor by mixing a foul-smelling additive with the gas (additive mercaptan). The additive causes LPG to smell like rotten eggs. This odor allows a leak of LPG to be easily detected. LPG is extremely flammable and highly explosive if ignited in an enclosed area.

LPG is non-toxic, however, it can cause suffocation. **LPG is heavier than air** and tends to fall to the ground and spread horizontally. The use of LPG in a liquid form is prohibited in New York City, except withdrawing of LPG in liquid form from an LPG container for hot air balloon operations if required by the nature of the operation.

LPG is stored under pressure inside specially designed containers. The LPG is usually stored inside the container in a liquid state. Greater amounts of LPG can be stored when it is in a liquid form. For most uses the gas changes into a vapor when it leaves the container. When the gas changes into a vaporous state it expands to 269 times its original volume. **The expansion rate causes liquid LPG to be a much greater fire hazard than a vapor leak. A liquid LPG leak can cause an explosion even in an outdoor location.** Safety procedures must be strictly followed to reduce the danger a potential unintended release of LPG.

### 3.2.2 Description of LPG containers

In New York City, LPG must be stored in portable containers which must be approved for use by the Federal Department of Transportation. **LPG Containers must be tested by the DOT approved vendors every five years.** The Certificate of Fitness holder is responsible for ensuring the container's condition including the marked date for statutory testing due. Container due for testing must be sent for testing to ensure that it is safe for use.

The containers are not filled to capacity with the LPG. A vapor space is left in the container to allow for expansion of the LPG. This is necessary because LPG expands when it becomes warmer. **Standard portable LPG containers are allowed to charge to a maximum of 100 pounds in weight. When portable containers are moved they must be secured to a specially designed hand truck. LPG containers and the related equipment must be protected from damage.** For example, LPG containers for temporary stationary service must be placed on firm foundation. Any containers with the bottoms of the skids or runners above the ground should be provided fire-resistive supports. Non-fire-resistive supports are only allowed when the Fire Department permits and the height of the outside bottom of the container does not exceed 5 feet above ground. (NFPA 58 6.6.5.4) LPG is sensitive to temperature change. Very low temperature may inhibit the proper function of the gas. The reason is that LPG vaporizes at the temperature above 24°F-27°F (dependent on the gravity). If the temperature is below the vaporization point, it will not vaporize and it will remain a solid. Different LPG has different vapor temperature because of its different mixture components. For example, propane, the principal component of most LPG, has a temperature of vaporization of -44 °F at atmospheric pressure, but the temperature of vaporization of butane (also at atmospheric pressure) is much higher, +32 °F. As a result, once you need to use any LPG at a temperature below 32 °F, you should consult with the manufacturer for the boiling point of the LPG you use. High temperatures can cause the pressure inside the container to increase to a dangerous level. LPG Containers should never be allowed to reach a temperature exceeding 125 °F. A protective partition must be used to shield the containers that are exposed to hot air blown by a heating appliance. Any blower-type and radiant-type units must not be directed toward any LPG container within 20 feet.(NFPA 58 6.19.4.6) An example of a typical LPG container is shown below.



**A Typical LPG Container**

### 3.2.3 LPG Operation

LPG is highly explosive when it accumulates in one area. **As a precaution LPG must only be used in well-ventilated areas. The LPG container must not be placed or used underground or in a below grade location.** The container must remain above ground at all times. The special considerations in manhole underground operations are addressed on the page 28-29 of this booklet.

LPG must only be used with LPG appliances which are approved by Nationally Recognized Testing Laboratories (NRTL). Connecting a LPG container to a non-approved appliance could result in serious injury. The Certificate of Fitness holder must be careful when connecting and disconnecting the containers to appliances. Generally, connection and disconnection of LPG containers for use should be performed outdoors. Where LPG use indoors is allowed, the connection and disconnection of the containers must be performed in a well-ventilated area. All valves on the appliance and the container must be closed when changing the container. This prevents the accidental leaking of gas into the atmosphere.

**Combustible materials must not be located less than 10 feet within any LPG appliance or container.** On the construction sites, if two or more heating-appliance units are located in an unpartitioned area on the same floor, the LPG containers of each such unit must be separated from the containers of any other such unit by at least 20 feet. (NFPA 58 6.19.4.7).

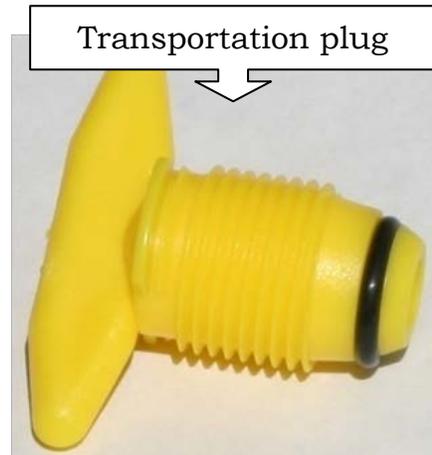
A sign explaining safe handling procedures for LPG should be posted near all LPG appliances. This sign should indicate the following:

- a) How to handle LPG containers safely
- b) How to connect all regulators, manifolds, and hoses to containers and appliances
- c) How to detect LPG leaks safely
- d) How to start up and shut down the appliance and related equipment
- e) The names, address, and telephone number of a local supplier
- f) Emergency number: 911

### 3.2.4 LPG Transportation

All LPG containers should be marked “Flammable” and either “LP-Gas,” or “Propane,” or “Butane.” When being transported, containers must be marked and labeled “Transportation”. The LPG containers must be secured in the upright position. The protective caps or plugs must be in place and container's valve must be closed when the containers are being transported or are not in use.

LPG containers with a capacity of 20 pounds shall be provided with transportation plugs that secure gas-tight the container's outlet valve connection. LPG containers with a capacity of more than 20 pounds shall be moved to another floor of the building only by freight elevator, construction elevator, or passenger elevator when approved, and such elevator shall be occupied only by those persons engaged in moving the containers. LPG containers with a capacity of 20 pounds or less shall be moved in the same manner, except that they may be moved in building stairwells if such stairwells are unoccupied.



### 3.3 GENERAL DESCRIPTION OF COMPRESSED NATURAL GAS (CNG)

CNG (Compressed Natural Gas) is made by compressing natural gas which is mainly composed of methane. Unlike the LPG, CNG does not liquefy under high pressure, it is stored inside the container in a gas state. **Any single CNG container must not exceed 381 SCF.** (Fire Code 3508.3)

Processed natural gas is tasteless and odorless. However, before gas is distributed to end-users, it is odorized by adding small amounts of odorants to assist in leak detection. Breathing natural gas in trace amounts is harmless; however, natural gas is a simple asphyxiant and can kill if it displaces air to the point where the oxygen content will not support life. It is prohibited to store, handle, use or sell any CNG that has not been satisfactorily odorized with mercaptans or other approved chemical.

Natural gas is a flammable gas. It can be hazardous to life and property by explosion. Natural gas is lighter than air, and tends to escape into the atmosphere. It makes CNG safer than LPG once there is a leak in the system. However, when natural gas is confined, such as within a building or other enclosed space, gas concentrations can reach explosive mixtures and, if ignited, result in blasts that could level and destroy buildings. Methane has a lower explosive limit of 5% in air, and an upper explosive limit of 15%. An example of typical CNG containers is shown below.



**CNG Containers**

The Certificate of Fitness holder must take care when connecting and disconnecting the containers to appliances. Generally, connection and disconnection of CNG containers for use should be performed outdoors. Where CNG use indoors is allowed, the connection and disconnection of the containers must be performed in a well-ventilated area. All valves on the appliance and the container must be closed when changing the container. This prevents the accidental leaking of gas into the atmosphere.

Flexible nonmetallic hose may be allowed at some applications (e.g. construction sites, emergency indoor repairs, manhole operations, etc.) However, the length of the hose must not exceed 30 feet when the activity is performed outdoors or not exceed 6 feet if the activity is performed indoors. The hose must be fabricated of materials that are designed for use with CNG and the hose must be color-coded red.

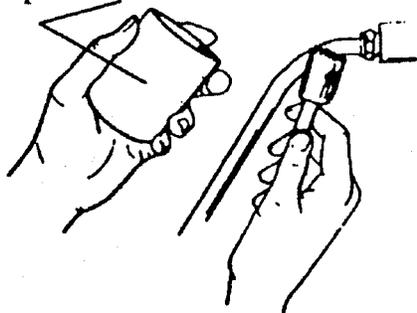
### 3.4 CHECK FOR LEAKS

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 may be used again.** If any leak of flammable gases or oxygen 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, only take the equipment out of service.** This equipment is very sensitive and must be repaired by the manufacturer only.

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.

These areas must be checked using a soap and water solution. **NEVER CHECK FOR LEAKS WITH A FLAME.** First make sure 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 likely 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 (for example, a match) should never be used when checking a connection for a leak.**

Soap and Water Solution



Occasionally, ice or moisture may build up on the regulator. Icy build-up indicates that the compressed gas is leaving the gas container in a liquid state. This is caused by a dangerous defect in the gas container. If ice build-up on appliance or connectors, shut off the main control valve of the fuel container, take it out of service, and return it to the supplier immediately. If the ice build-up is on the gas container itself or its control valve, you should call 911 immediately.

## PART 4. PORTABLE FIRE EXTINGUISHERS

All persons conducting hot work operations shall be trained in the use of portable fire extinguishers, and shall be capable of extinguishing fires when they are limited in size and spread such that they can readily be extinguished using a portable fire extinguisher.

A portable fire extinguisher with at least a 2-A:20-B:C rating (a minimum 3-A:40-B:C rating fire extinguisher on torch-applied roofing system operations) must be readily accessible within 30 feet of the location where hot work is performed and where the fire guards are positioned. In case of fire, 911 must be called.



In the event of a fire extinguisher has been discharged, a fully charged replacement is required before work can resume. **The C of F holder is recommended to be trained for the use of portable fire extinguisher.** Portable fire extinguishers are important in preventing a small fire from growing into a catastrophic fire, however, they are not intended to fight large or spreading fires. **The trained Certificate of Fitness holders should only consider extinguishing fires when they are limited in size and spread such that they can readily be extinguished using a portable fire extinguisher.** 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 by the building fire extinguishing systems or trained firefighters only. In case of any fire, FDNY must be notified. 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 make sure you use it

properly. P.A.S.S. stands for Pull, Aim, Squeeze, Sweep.

All fire extinguishers must be installed so that the top of the extinguisher is not more than 5 ft above the floor and the clearance between the bottom of the extinguisher and the floor is not less than 4 in. In other words, **no fire extinguisher is allowed to put on floor.**



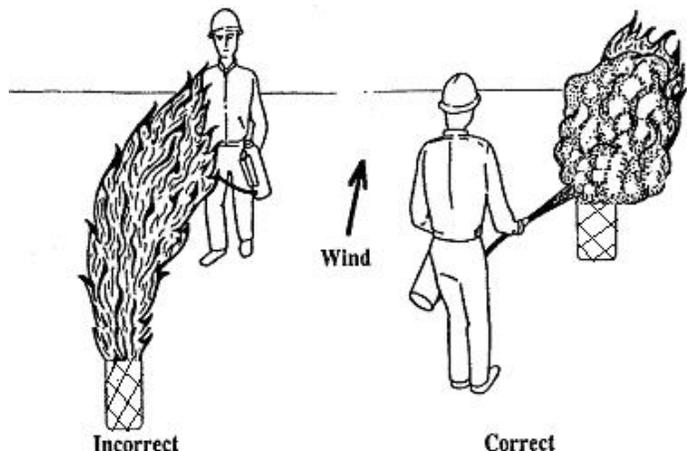
Fire extinguisher in a construction site.



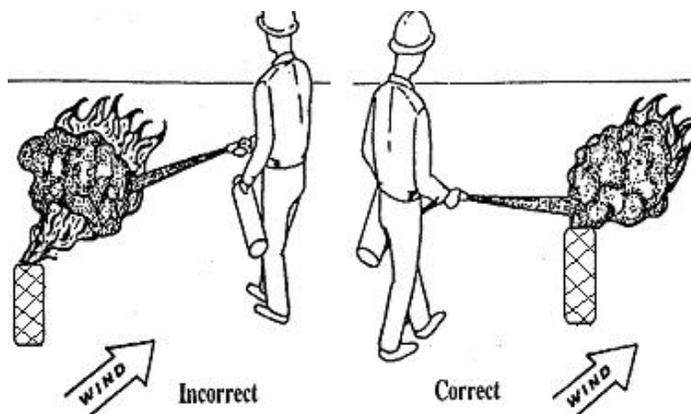
Improper floor placement of Fire Extinguisher.

#### 4.1 Operation Instructions for a Fire Extinguisher

Special care must be taken when extinguishing a gas fire caused by a leak. The easiest way to extinguish the fire is to shut off by using the Emergency Shut Off valve until the flame is extinguished. **In case of any fire, Fire Department must be notified.** 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 correct ways to approach a fire are shown below.



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. The correct way to direct the dry chemical stream is shown below.



**For the piped gas, the gas supply must be shut off first and then call 911.** This is safer than allowing the flammable gas (e.g. acetylene or LPG) 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 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) and the gas supply is limited (e.g. it is from a cylinder), allow the flame to burn itself out and call 911.** In the meantime, you should try to control the scene and prevent the fire spreading to the surrounding materials. **The trained Certificate of Fitness holders should only consider extinguishing fires when they are limited in size and spread such that they can readily be extinguished using a portable fire extinguisher.** 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 by the building fire extinguishing systems or trained firefighters only.

## 4.2 Fire Extinguishers

The Certificate of Fitness holder must be familiar with the different types of fire extinguishers available at the work site. The Certificate of Fitness holder must know how to operate the extinguishers in a safe and efficient manner. The Certificate of Fitness holder must also know the difference between the various types of extinguishers and when they may be used. A description of the 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 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 shutting off 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 below.

Examples of fire extinguishers

10-B:C (10BC)	3-A:40-B:C(3A40BC)	3-A:40-B:C(3A40BC), wheeled
		

## 4.3 Typical Fire Extinguishers

Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguisher may be used on. 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.	
<b>K</b>	Cooking media (Vegetable or Animal Oils and Fats)	

	Class A, B & C Fires Multi-purpose Fire Extinguisher
	Class B & C Fires
	Class A & B Fires
	Class A Fires

**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.

**4.4 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. It is 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. The information of the monthly inspection record must include the date the inspection was performed, the person performing the inspection, and those portable fire extinguishers found to require corrective action. Such recordkeeping must be either attached to the extinguisher or on an inspection checklist maintained on file. Labels or markings indicating fire extinguisher use, or classification, or both shall be placed on the front of the fire extinguisher. At least once per year, all fire extinguishers must be maintained by a FDNY approved company and a W-96 Certificate of Fitness holder.

Monthly inspection tag. →



## **PART 5. USE OF LPG/CNG FOR ASPHALT MELTER**

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### **5.1 TAR KETTLE**

Tar kettle is designed to heat tar, asphalt, pitch or similar materials before it can be used for construction purposes, typically for waterproofing operations or street repair. Tar kettle does not include asphalt melters. It shall be unlawful to store, handle or use tar kettles that utilize flammable liquid as a fuel.

The operation of a tar kettle that requires a permit shall be under the personal supervision of a person holding a Certificate of Fitness.



Tar kettles must be equipped with tight-fitting lids. Tar kettle must not be moved when the heat source of the tar kettle is operating, except when the tar kettle is in the process of patching road surfaces. The LPG/CNG containers must be protected against physical damage and the heat generated by the kettle heater. This is achieved by placing the LPG/CNG container behind a heat shield. The shield prevents radiated heat and flames from reaching the container. The LPG/CNG must be located at least 10 feet from the burner. (Fire Code 303.3) This is important because the pressure of the gas in the container could increase to a dangerous level. Each tar kettle must also be equipped with metal covers. These covers are used to smother potential fires. Tar kettle must not be located within 20 feet of any combustible material, combustible building surface or any buildings opening. Tar kettles must be within a controlled area identified by the use of traffic cones,

barriers or other approved means. Tar kettle should not be utilized inside of a building or structure. (Fire Code 303.2)

The following regulations must be followed when using LPG/CNG to heat a tar kettle:

- (a) A tar kettle may be used outdoors only.
- (b) A tar kettle must NOT be utilized on the roof of a building or structure. Roofing kettles, and operating tar kettles shall not block means of egress, gates, roadways or entrances.
- (c) LPG/CNG Container valves must be closed when burners are not in use.
- (d) A gas regulator and excess flow valve must be installed on all heating devices. A shut off valve must also be installed on the LPG/CNG container.



- A fire was sparked by a kettle when the tar kettle was used on the roof of Northside Piers tower in Brooklyn. (Sep. 2007)
- No tar kettle is allowed to be used on roof according to the 2014 NYC Fire Code.

The tar kettle must be continuously supervised by a G-40/G-41 Certificate of Fitness holder. The holder must be within 100 feet of the kettle, have the kettle within sight and have unobstructed access to the kettle. He/she is responsible for the safe operation of the equipment. He/she must also make sure that all safety regulations are observed. The certificate of fitness holder shall not have to climb or descend a ladder or circumvent any obstacle to gain access to the kettle.

## 5.2 ASPHALT MELTER



Asphalt melters (or rubberized asphalt melter) are approved device designed to heat asphalt, typically for waterproofing operations. It utilizes LPG or CNG (Compressed Natural Gas) to generate an enclosed flame. **The use of CNG fueled asphalt melters shall be operated in**

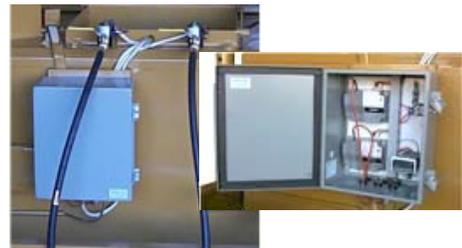
**the same manner as LPG fueled tar kettles. Only the LPG-fueled asphalt melters may be utilized on the roof of non-combustible construction in accordance with NYC Fire Rules.** It shall be unlawful to store, handle or use tar kettles that utilize flammable liquid as a fuel. In summary, the asphalt melter must be designed to

- (1) be constructed of noncombustible materials  
and
- (2) be equipped with tight-fitting lids  
and
- (3) utilize an enclosed flame indirectly  
and
- (4) provide with a thermostatic control  
and
- (5) provide with an automatic shut-off to limit the temperatures.



Thermostatic control

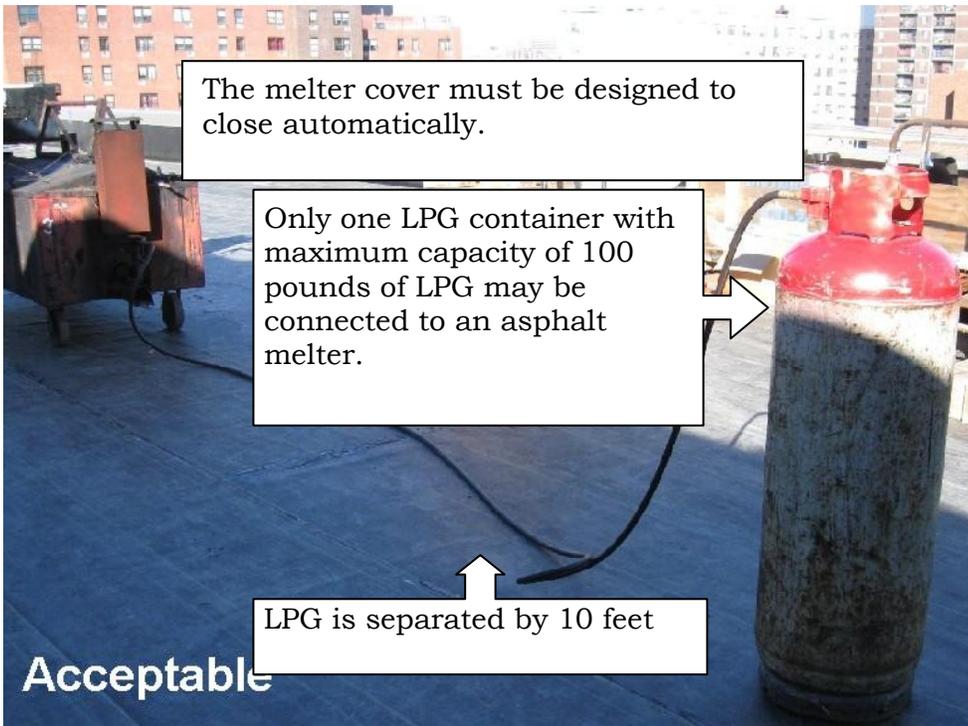
These devices help user to ensure the temperature of the asphalt not exceed 425°F or 50°F below the flash point of the asphalt.



Automatic shut-off system

If any one of the above requirement is not met for the heating device, it may be categorized as a tar kettle instead of an asphalt melter.

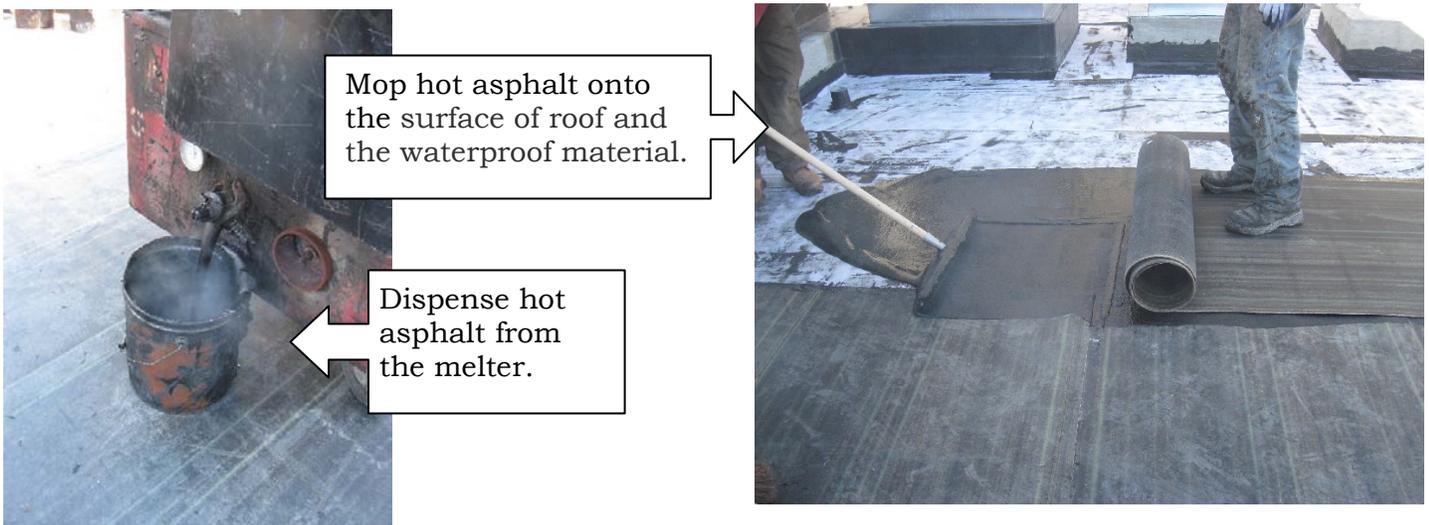




Hot-mop roofing using asphalt

An asphalt melter must only be used on non-combustible roofing operation. Asphalt melters shall not be located within 20 feet of any combustible material, combustible building surface or any building opening and within a controlled area identified by the use of traffic cones, barriers or other approved means. Asphalt melters shall not block means of egress, gates, roadways or entrances.

Roofing mops must be stored outdoors. When soaked with asphalt the mops are easily ignited. All roofing mops must be thoroughly cleaned after use. They must be kept at least 20 feet away from all sources of ignition. The procedures of hot-mop operation should be done as the follows:



LPG asphalt melter may be used on roof of non-combustible construction in accordance with NYC Fire Rules. Following requirements must be complied with:

- (a) The maximum capacity of the asphalt melter must not exceed 200 gallons of asphalt, or such lesser amount as may be safely supported by the roof structure.
- (b) 2 asphalt melters maximum on a roof.
- (c) The Certificate of Fitness holder responsible for the personal supervision of asphalt melters shall be provide with a cellular phone as means for immediate emergency notification.
- (d) Only LPG containers connected for use shall be kept on the roof.

Asphalt melters shall not be transported or otherwise moved when the heat source for the kettle or melter is operating. The asphalt melter must always be operated under the personnel supervision of a G-40/G-41 Certificate of Fitness holder. He/she is responsible for safe operation of the equipment and he/she must make sure that all safety regulations are followed including wearing appropriate personnel protective equipment.

An operating asphalt melter requiring a permit shall be under the personal supervision of a person holding a G-40/ G-41 certificate of fitness. The certificate of fitness holder shall be within 100 feet of the melter, have the melter within sight and have unobstructed access to the melter. Ladders and other obstacles shall not form a part of the route between the certificate of fitness holder and the melter. The certificate of fitness holder shall not have to climb or descend a ladder or circumvent any obstacle to gain access to the melter.

### **5.3 MARKING TRAFFIC LINE**

LPG/CNG may be used to fuel the heating kettle for paint used to mark traffic lines or to do street repair. LPG storage and use on any motor vehicle for the purpose of marking traffic lanes must be limited to 4 containers and CNG must be limited to a total capacity of 3.400 SCF. **Per LPG containers must not exceed 100 lbs. per single CNG container must not exceed 381 SCF.** The vehicle must be registered with and approved by the Fire Commissioner.

The gas container or tank must be:

- (1) installed on the motor vehicle in a manner that will protect it from physical damage;
- (2) installed to prevent their jarring loose and slipping or rotating
- (3) securely mounted in a manner so that it is not subject to wear while the vehicle is in motion.

The Certificate of Fitness holder must:

- (1) personally supervise the truck used to mark traffic lines
- (2) make sure that all safety regulations are obeyed
- (3) make sure that all safety devices, vents, connecting lines, chains, and guards are kept in good condition and working order.

### **5.4 FIRE SUPPRESSION**

At least one 3-A:40-B:C rated fire extinguisher must be within 25 feet of each asphalt melter. One more 3-A:40-B:C rated fire extinguisher is needed on the roof being covered. For the kettle used for marking traffic lines or doing street repair, at least one 20-B:C rating fire extinguisher must be provided.