Study Materials
For the Certificate of Fitness for
Liquefied Petroleum Gases
LPG

Reading pages 1 to 12 covers general LPG information.
Page 2 is the NOE (Notice of Examination). Please read the NOE for more information on taking a LPG Certificate of Fitness Exam.

G-22 Pages: 4-12 plus 16-17
G-23 Pages: 4-12 plus 15
G-27 Pages: 4-12 plus 14-15
G-36 Pages: 4-12 plus 15-16
G-40 Pages: 4-13
G-44 Pages: 4-12

PLEASE NOTE: Reading the entire booklet is highly recommended for gaining information on all uses of LP Gases.

NOTICE OF EXAMINATION FOR

Title: **CERTIFICATE OF FITNESS FOR:**

Use of LPG in HI-LO (Forklifts) G-22
Fuel at Outdoors Events G-23
Use of LPG for Concrete Drying (G-27)
Use of LPG in Manhole Operations (G-36)
Use of LPG for Tar Kettles (G-40)
Storage and Handling of LPG (G-44)

Date of Test: Written tests are conducted Monday to Friday (except legal holidays) 9:00 AM to 2:30 PM.

QUALIFICATION REQUIREMENTS

1. Applicants must be at least 18 years of age.
2. Applicants must have a reasonable understanding of the English language.
3. 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, character, physical conditions, experience, and address of premises where applicant will be employed.
4. Applicants must present two (2) forms of satisfactory identification i.e., driver's license, passport, vehicle registration, library card, or equivalent.

APPLICATION INFORMATION

Application Fees: $25.00 for originals and $5.00 for renewals. The fee may be paid in cash, money order, or personal check payable to New York City Fire Department. The $25.00 fee must be payable by all applicants prior to taking the Certificate of Fitness test. Application forms are available at the Public Certification Unit, 1st floor, 9 MetroTech Center, Brooklyn, NY 11201.

TEST INFORMATION

Test: The test will be of the written, multiple choice type. A passing score of at least 70% is required in order to secure a Certificate of Fitness. Individuals holding a license as a Professional Engineer (PE) or Registered Architect (RA) issued by the NYS Dept. of Education plus one year of fire protection or fire safety experience may have the written test waived. This procedure is the **Alternative Issuance Policy.** Call (718) 999-1993 for additional information and forms.

This study material will help you prepare for the examination for the Certificate of Fitness for Handling and Using Liquefied Petroleum Gases (LPG). The study material includes information taken from the Fire Prevention Code of the Bureau of Fire Prevention. The study material does not contain all of the information you need to know to work with LPG. 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.

All questions on the 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. The safest method to ignite a heater fueled by LP Gas would be a:

A) wooden match.
B) flint striker.
C) cigarette lighter.
D) piece of burning newspaper.

The correct answer is "**B**". You would press "**B**" on your touch-screen monitor.

_____2. LP Gas cylinders and connections should be protected against:

A) mechanical damage.
B) corrosion.
C) extreme weather conditions.
D) all of the above.

The correct answer is "**D**". You would press "**D**" on your touch-screen monitor.

LIQUIFIED PETROLEUM GASES

Liquified petroleum gases (LP Gases or LPG) are often used as a fuel source. LP gases include propane, propylene, butane, and butylene. The most commonly used LP Gases are butane and propane. LP Gases are often referred to as "Bottled Gas". LPG is used in domestic, commercial, agricultural, and industrial settings. For example, propane is commonly used to heat areas at construction sites and as fuel for forklifts.

DESCRIPTION OF LIQUID PETROLEUM GAS

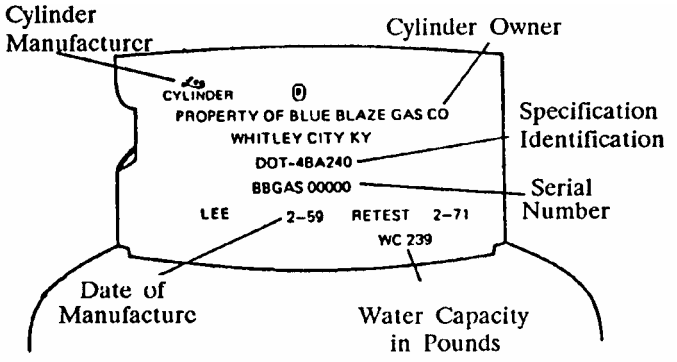
LP Gases are naturally colorless and odorless. They are given an odor by mixing a foul-smelling additive with the gas. The additive causes LP Gas to smell like rotten eggs. This odor allows a leak of LP Gas to be easily detected. LP Gases are extremely flammable and highly explosive if ignited in an enclosed area. LP Gases are non-toxic, however, they can cause suffocation. **LP Gases are heavier than air** and tend to fall to the ground and spread outwards. The use of LPG in a liquid form is prohibited in New York City.

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

DESCRIPTION OF CYLINDERS

In New York City LP Gases must be stored in portable cylinders. Cylinders must be approved for use by the Federal Department of Transportation. **Cylinders must be re-tested every five years.** ***The Certificate of Fitness holder is responsible for checking the retest date and having the cylinder inspected, on time, by the supplier.***

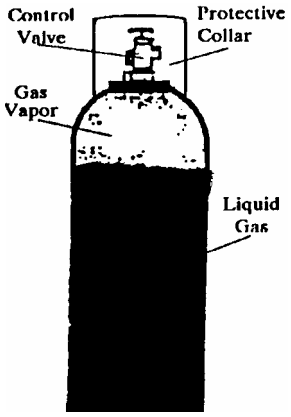
Several markings are stamped on the protective collar or near the control valve on the approved cylinders. A cylinder should not be accepted if it does not meet the time frames set by the Fire Department. Typical markings are shown below.



Typical DOT Cylinder Markings

The cylinders are not filled to capacity with the LP Gas. **A vapor space is left in the cylinder to allow for expansion of the LP Gas**. This is necessary because LP Gas expands when it becomes warmer. **Standard**

portable LP Gas cylinders may be charged to a maximum of 100 pounds in weight. When portable cylinders are moved they must be secured to a specially designed hand truck. LP Gas cylinders and the related equipment must be protected from extreme temperature and physical damage. High temperatures can cause the pressure inside the cylinder to increase to a dangerous level. Sometimes a cylinder is exposed to hot air blown by a heating appliance. If that is the case, a protective partition must be used to shield the cylinders. An example of a typical LP Gas cylinder is shown below.

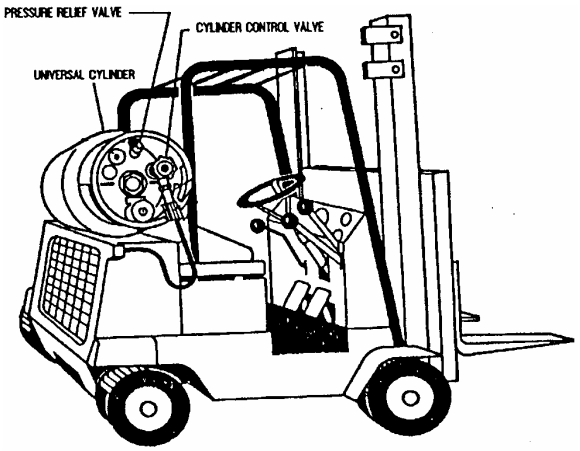


A Typical LP Gas Cylinder

The LP Gas is released from the cylinder by opening the control valve. **The control valve must be opened by hand.** The valve should be opened carefully to make sure that the valve is not damaged. The control valve is opened by turning the valve two full revolutions in a counter-clockwise direction. **The valve must never be forced open by using a wrench.** The valve must not be forced past the fully open position since that might damage the valve.

There are two types of LP Gas cylinders. One type is known as the **STANDARD**-type cylinder. A pressure relief valve is installed on the top of the standard LP Gas cylinder. The pressure relief valve opens when the pressure in the tank becomes too great for safe operation. The valve allows the excess pressure to escape into the atmosphere. The relief valve closes when the pressure in the cylinder returns to a safe level. The relief valve will operate properly only if the cylinder is in the upright position. If the cylinder is not upright, liquid gas will escape from the cylinder. Therefore the standard type cylinder must be kept in an upright position when it is being used or transported.

The other type of cylinder is called the **UNIVERSAL**-type cylinder. The universal type cylinder may be used either in an upright or a horizontal position. A special pressure relief valve is installed on the universal type cylinder. Universal type cylinders are used when it is difficult to maintain a standard type cylinder in an upright position. For example, a universal cylinder may be used to fuel a forklift truck. The cylinder is usually strapped horizontally to the rear of the forklift truck as shown on the next page.



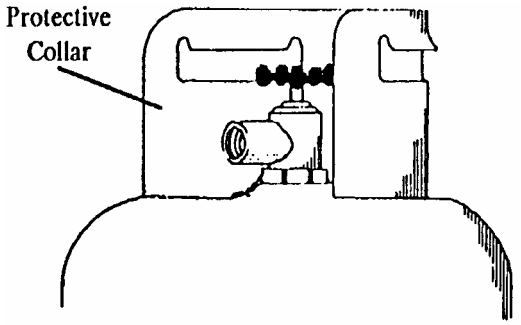
A Typical Forklift Truck

Excess Flow Check Valve

When LP Gas is used on a motor vehicle as an engine fuel for forklifts or used for other purpose, such as marking traffic lanes or cooking equipment in mobile units, the excess flow check valve must be an integral part of the LP Gas cylinder. If the LP Gas cylinder is not equipped with an internal excess flow check valve, it must be installed by the certificate of fitness holder. The excess flow check valve acts as a safety device when the control valve is open. It also shuts off the gas supply to the appliance (grill, heater, or forklift) when the regulator is physically damaged. For example, the excess flow check valve will shut off the gas supply if the cylinder falls and the regulator is damaged in the fall. The excess flow check valve may also shut off the gas supply when the cylinder control valve is opened to quickly.

Protective Cap or Collar

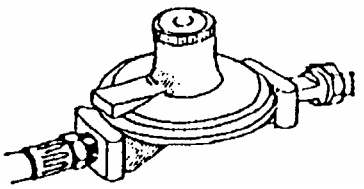
Every LP Gas cylinder must have either a protective cap or a collar. These devices protect the cylinder control valve from physical damage. The protective cap is shaped like an inverted cup. It is screwed on top of the cylinder. It must be in place when the cylinder is not in use. The protective collar is welded onto the top of the cylinder. The collar extends above the height of the cylinders control valve. An example of a cylinder with a protective collar installed is shown below.



A Typical Protective Collar

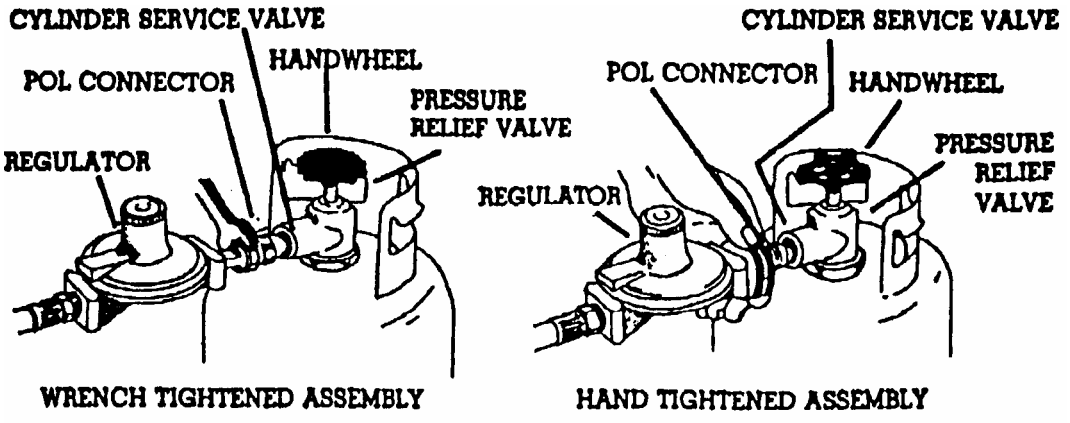
USING LP GASES

A regulator must be installed before any LP Gas cylinder is used to fuel any appliance. The regulator controls the discharge rate of LP Gas from the cylinder. The discharge rate of the regulator is factory-set and should never be adjusted. An example of a typical regulator is shown below.

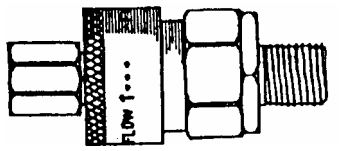


A Typical Regulator

The regulator is threaded into the control valve at the top of the cylinder. These connections have left-handed threads. They are tightened by turning the assembly counter-clockwise. Some connections may be tightened by hand only. Other connections must be tightened with a wrench. An example of each type of connection is shown on the following page.



A third kind of connection may be used to connect the regulator to the control valve. It is called a quick release connection. This allows the user to make the connection without the use of tools. An example of a quick release connection is shown below.



A Quick Release Connection

The regulator is also connected to a hose that supplies the LP Gas appliance. Only approved hoses designed for a working pressure of 350 psi. All regulating equipment, when using LP Gases, must be approved as well. Hoses and related equipment must be protected from wear and physical damage. A leak in the cylinder or related equipment could cause a fire or explosion.

The Certificate of Fitness holder must regularly inspect the cylinders, connections, and appliances for leaks. A foul smelling odor may indicate that there is a leak. When a leak is detected the cylinder control valve must be closed immediately. The cylinder must be isolated to a well-ventilated area, tagged, and returned to the supplier. The cylinder may not be used again until the leak is repaired. The damaged cylinder must be repaired and re-tested by an authorized person.

LP Gas is highly explosive when it accumulates in one area. As a precaution LP Gas must only be used in well-ventilated areas. Fans may be used to ventilate a confined space. The LP Gas cylinder must not be placed underground or in a below grade location. **The cylinder must remain above ground at all times.**

Sometimes LP Gas is used to provide heat in buildings under construction. Heaters must only be used in a well-ventilated area and must not be placed on unprotected wood flooring. All cylinders must be secured in an upright position. **Combustible materials must be located at least 10 feet away from any LP Gas appliance or cylinder.**

STORAGE RULES

All LP Gas cylinders must be stored outdoors in a especially designed storage enclosure. The enclosure must protect the cylinders against extreme temperatures, tipping over, physical damage, and tampering. The enclosure must be located above ground in a well-ventilated area. The LP Gas storage must be accessible from the street. **It must be located at least 50 feet away from any building** occupied as a multiple dwelling**,** and at least 100 feet away from any school, hospital, church, or place of public assembly. Several **NO SMOKING** signs must be posted inside the storage enclosure. A sign must be posted on the outside of the enclosure. The sign should read:

DANGER - LP GAS
KEEP FIRE OR FLAME AWAY
NO SMOKING

Storage at Construction Sites

The maximum allowable quantity of LP Gas in any single storage enclosure on construction sites must not exceed 2500 pounds or a total capacity at any construction site must not exceed 5000 pounds. The distance between two storage enclosures on a construction site must be at least 50 feet. All LP Gas cylinders, full or empty, and which are not in use must be stored in an outdoors storage enclosure located at least 25 feet of the building under construction. The storage enclosure must be kept securely locked when not in use. Flammable and combustible materials must be kept at a safe distance from the enclosure and must be located at least 50 feet from such enclosure.

The Certificate of Fitness holder is responsible for the safe storage and use of the LP Gas cylinders. Only cylinders in use are permitted inside a building under construction. No extra cylinders may be located in the building while work is in progress. **Absolutely no cylinders may be stored indoors overnight**. Cylinders must be taken outside at the end of each work day. All LP Gas cylinders should be marked **Flammable - LP Gas** or **Flammable - LPG**.

The LP Gas cylinders must be secured in the upright position, The protective caps must be in place and cylinder's valve must be closed when the cylinders are being transported or are not in use.

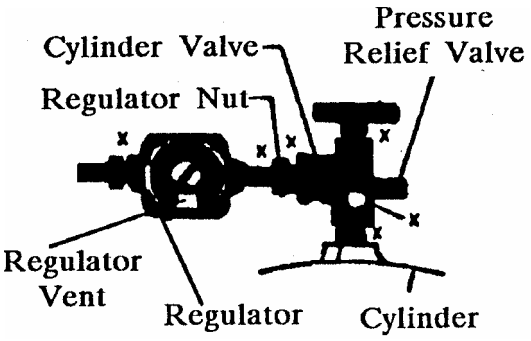
LP Gas storage enclosure must be protected by at least one 10-B/C fire extinguisher located outside of the enclosure. Each construction site storage enclosure shall be equipped with at least one 40-B/C rated, wheeled, fire extinguisher.

SAFETY REGULATIONS

LP Gas must only be used with approved LP Gas appliances. Connecting a cylinder to a non-approved appliance could result in serious injury.

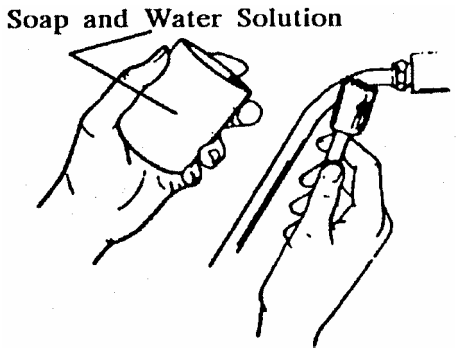
The Certificate of Fitness holder must take care when connecting and disconnecting the cylinders to appliances. The cylinders, valves, hoses, and related equipment should be inspected for physical damage. Special care should be taken to identify any defects that may cause a leak. Any defective components that are discovered must be either repaired or replaced before the equipment may be used again. For example, the Certificate of Fitness holder may repair a hose by cutting out the affected areas and splicing the hose. Taping is not an acceptable way to repair hoses. The Certificate of Fitness holder must not attempt to do any repairs on the regulators or the control valves. This equipment is very sensitive and must be repaired by the manufacturer only. The LP Gas cylinders must be replaced when they are empty. It is illegal to refill LP Gas cylinders in New York City.

After the new cylinder has been connected to the appliance, all connections must be checked for leaks. The areas that must be checked are marked with an **X** in the drawing on the following page.



Areas to Check for Leaks

These areas must be checked using a soap and water solution. First make sure that all connections are tight. Then open the cylinder valve. Each connection is checked by brushing a soap and water mixture on the connection. The connection should be checked to see if any air bubbles are present. If no air bubbles are visible there is no leak. However, if bubbles are present there may be a problem with the connection. The suspected fittings should be disconnected and cleaned. Then the connection is tightened and the checking procedure is repeated. If the bubbles are still visible there is a problem with the connection. The fittings should be repaired or replaced before the equipment is used again. **A lighted flame (for example, a match) should never be used when checking a connection for a leak.**



Occasionally, ice or moisture may build up on the regulator. Icy build-up indicates that the LP Gas is leaving the cylinder in a liquid state. This is caused by a dangerous defect in the cylinder. The cylinder must be returned to the supplier immediately. The cylinder may not be used until it is repaired by the supplier.

An LP Gas cylinder must not be rolled on its side or its rim. It must be moved only by using approved lifting equipment. Cylinders must never be dropped or thrown from any height. Empty cylinders must be handled in the same manner as full ones. They should be marked empty and stored separately from full cylinders. All empty cylinders must be promptly removed by vendors.

LP Gas cylinders may be moved within a building for tar kettle or torch operations on a roof. Such movement must be under the personal supervision of a certificate of fitness holder. Only building's freight elevators may be used and all LP Gas cylinders must be equipped with transportation plugs as well.

LP Gas cylinders must be connected and disconnected only by a Certificate of Fitness holder. Wherever possible connecting or disconnecting an LP Gas cylinder should be done outdoors. Only approved tools should be used when connecting the hose to the cylinder and the appliance. All valves on the appliance and the cylinder must be closed when changing the cylinder. This prevents the accidental leaking of gas into the atmosphere.

A sign explaining safe handling procedures for LP Gas must be posted near all LP Gas appliances. This sign must indicate the following:

a) How to handle LP Gas cylinders safely
b) How to connect all regulators, manifolds, and hoses to cylinders and appliances
c) How to detect LP Gas 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) The emergency telephone number of the local fire house

LP Gas cylinders may be transported only in approved vehicles. A transportation permit issued by the Bureau of Fire Prevention (FDNY) is required for each vehicle. LP Gas cylinders may be delivered only to sites displaying a permit or Letter of Authorization issued by the Fire Commissioner.

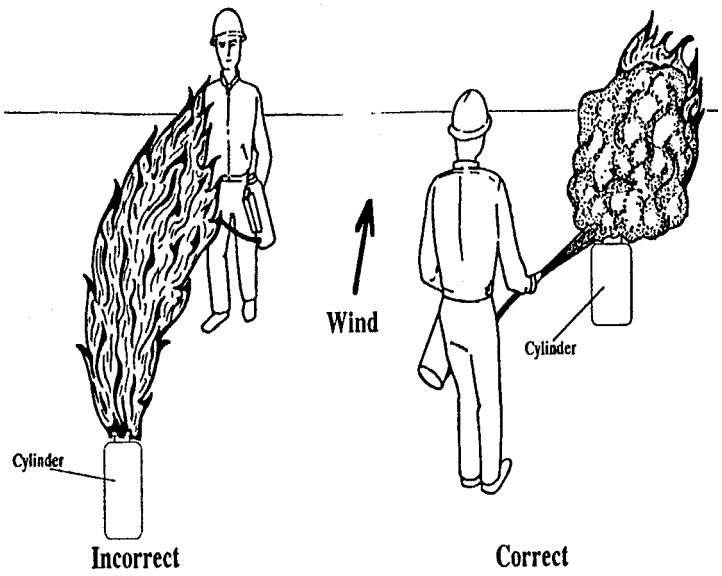
Under no circumstance may LP Gas cylinders be transported through tunnels. Alternate routes must be taken to avoid the tunnel. The Police Department will issue summons to anyone caught transporting a LP Gas cylinder through a tunnel.

At least one dry chemical or carbon dioxide fire extinguisher is required at all locations where LP Gas is used, stored or transported. In case of a fire, the local fire house must be called before any body else.

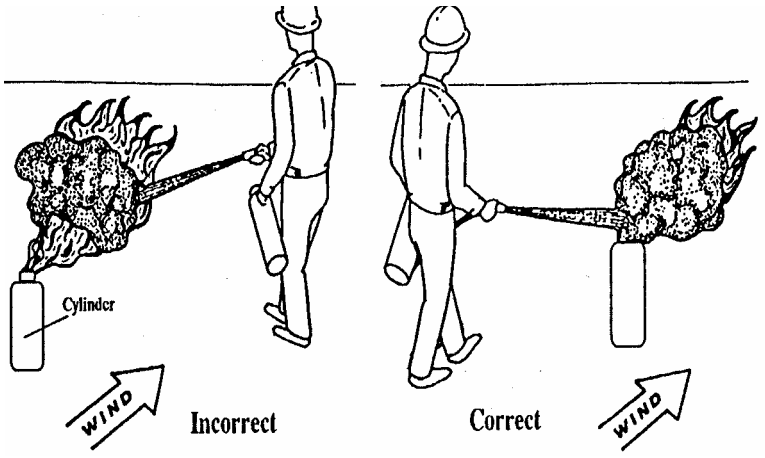
FIRE EXTINGUISHING PRACTICES

Fire extinguishers must be used in accordance with the instructions painted on the side of the extinguisher. A dry chemical or carbon dioxide must be used on a LP Gas fire.

Special care must be taken when extinguishing a LP 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. 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.



The gas supply must be shut off as soon as the flame is extinguished. Never attempt to extinguish the flame unless the gas supply may be shut off after the fire is extinguished. When it is not possible to shut off the gas supply, allow the flame to burn itself out. This is safer than allowing the LP Gas to leak out. A LP Gas leak could result in a serious explosion if it were ignited.

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 three 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), for which the quenching-cooling effect of quantities of water or solutions containing large percentages of water is most effective in reducing the temperature of the burning material below its ignition temperature..

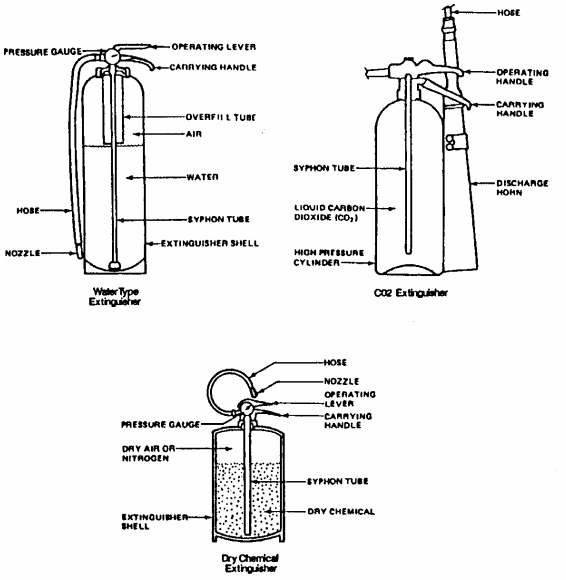
Class B fires are caused by flammable petroleum products or other flammable liquids, greases, etc., for which the blanketing-smothering effect of oxygen-excluding media such as CO_2, dry chemical or foam is most effective.

Class C fires involve electrical equipment. The electrical non-conductivity of the extinguishing media is of first importance. These fires must be extinguished with non-conductive media such as CO_2 or dry chemical.

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 Class A, B, or C fires.
Examples of Water type, C02 and Dry Chemical extinguishers are shown below.

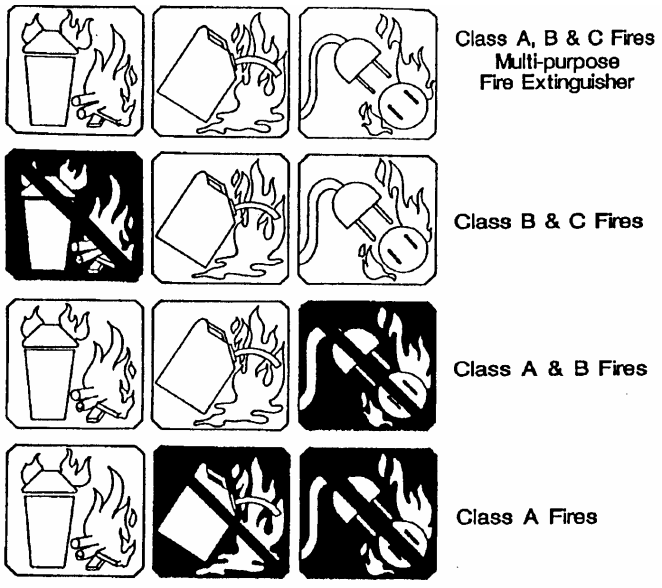
Examples of typical fire extinguishers are shown on the following page.



Typical Fire Extinguishers

Usually operation instructions are clearly painted on the side of the fire extinguisher. They clearly describe how to use the extinguisher in case of an emergency. The Certificate of Fitness holder should become familiar with the instructions for the extinguisher at his/her work site.

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.



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.

USE OF LPG FOR TAR KETTLES

Gas heaters are often used to fuel tar kettles. They are used to heat the tar before it can be used for construction purposes.

The tar kettle may be portable or fixed to a motor vehicle. When fixed to a vehicle the LP Gas cylinder must be located in a safe location. This location must protect the cylinder against physical damage and the heat generated by the kettle heater. This is achieved by placing the cylinder behind a heat shield. The shield prevents radiated heat and flames from reaching the cylinder. This is important because the pressure of the gas in the cylinder could increase to a dangerous level.

The following regulations must be followed when using LP Gas to heat a tar kettle:

(a) A tar kettle may be used outdoors <u>only.</u>
(b) A tar kettle may not be used on the roof of a structure if the roof is combustible. However, the kettle may be used on the roof if the roof is non-combustible.

(c) Roofing mops must be stored outdoors. When soaked with tar 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.
(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 LP Gas cylinder.

The tar kettle must be continuously supervised by a Certificate of Fitness holder. He/she is responsible for the safe operation of the equipment. He/she must also make sure that all safety regulations are observed.

Every tar kettle unit must be supplied with at least one 2-A:20-B/C rated fire extinguisher. Buckets of sand may also be used to extinguish a potential fire. Each tar kettle must also be equipped with metal covers. These covers are used to smother potential fires.

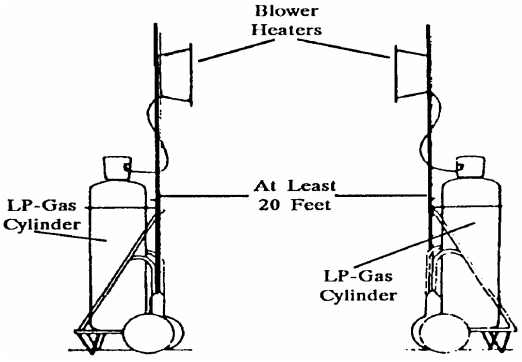
PERMITS

A permit is required for the operation of a tar kettle at a job site. This permit is issued by the Fire Commissioner. The permit is valid for one year. A city-wide permit may be obtained for tar kettle operations. A city-wide permit is valid for only 30 days at any given job site and does not allow the reserve storage of LP Gas cylinders at the job site. A new application must be submitted if a single job will last more than 30 days. The permit must be presented to any Fire Department representative upon request.

USE OF LPG FOR CONCRETE AND PLASTER DRYING AND CURING

LP Gas heating units are commonly used for drying or curing concrete and plaster at construction sites. The LP Gas heaters may only be used in well ventilated areas. Cylinders or heaters using LP Gas may not be used in areas below grade(i.e., below ground level). Regulations limit the number of LP Gas cylinders and heaters allowed on each floor.

The heaters must be placed at least 6 feet from the LP Gas cylinder and any combustible materials. With some units the heat is forcefully blown out of the heater. These heaters are usually called **Blower Heaters**. Sometimes the heated air must be blown in the direction of the LP Gas cylinder. When this occurs the cylinder must be placed at least 20 feet away from the heater. Heat shields may also be used to protect the cylinder from radiated heat. Heaters may not be placed on unprotected wood flooring. An example of two blowers facing each other is shown below.



Blower Heaters

LP Gas cylinders used for plaster drying and curing concrete must be placed at least 20 feet apart from each other. LP Gas cylinders may be manifolded together to serve a heater. The maximum allowable quantity of LP Gas at one manifold must not exceed 300 pounds. The length of the hose must not exceed 30 feet. The manifolds must be placed at least 20 feet apart from each other.

A certificate of fitness holder must supervise the use of heaters for concrete and plaster drying or curing. A certificate of fitness holder must patrol and inspect the area being heated every hour. These patrols must be recorded in a logbook. This logbook must be made available to any official representative from the Fire Department upon request.

Fire Protection

Fire extinguishing devices are required when using LP Gas heaters. Dry chemical fire extinguishers are recommended. However, when working at a construction site a charged hoseline or several buckets of water may be required also. Six buckets of water are required for each 5,000 square feet of floor space. The hose must be connected to a reliable water supply. The hose must be at least ¾ inch in diameter, and long enough to reach all parts of the floor. Both the hose and the buckets of water must be protected against freezing. Non-freezing extinguishers may also be used as acceptable fire protection devices. However, they must be approved

LPG USED TO FUEL COOKING EQUIPMENT AT OUTDOORS EVENTS

LP Gas cylinders and related equipment are usually located in tents or behind concession stands. These tents and concession stands must be designed to permit free access to the LP Gas unit. An emergency access lane at least 15 feet is required for each LP Gas unit. The lane must remain unobstructed at all times. A solid yellow circle must be painted in the middle of the access lane. The circle must be 12 inches in diameter. The circle must indicate the location of each fire hydrant within the boundaries of the event. All hydrants and fire alarms, and other emergency equipment must be kept in good working order. No obstruction may be placed in front of such equipment.

All LP Gas cylinders and related equipment must be stored in a protective enclosure. This enclosure must be designed to prevent public access. Each location where LP Gas is used must be equipped with at least one-pound dry chemical or carbon dioxide fire extinguisher.

The area surrounding the LP Gas equipment must be kept clean at all times. No combustible materials may be stored next to the LP Gas cylinders and related equipment. Cylinders must be at least 2 feet from the cooking equipment and any combustible material. All garbage and waste materials must be stored in a covered container. The container must be designed to prevent accidental ignition of the collected waste materials. The container must emptied regularly.

Sometimes conditions prevent strict compliance with the guidelines outlined above. In such cases the Fire Commissioner may modify or waive some of the required safeguards. If special circumstances arise the Fire Commissioner's office should be notified. Applications for modifications and waivers will be dealt with on an individual basis.

LPG USE IN MANHOLE OPERATIONS

LP Gas cylinders may be used to fuel appliances used at manholes or similar underground structures. Special rules must be followed when using LP Gas in manholes.

Flammable liquids and vapors often accumulate in manholes or other below ground locations. They accumulate because they are heavier than air and tend to fall to the lower ground level. They may be highly explosive and easily ignited. These liquids and vapors may be also toxic or suffocating. The vapors pose a serious threat to the safety of those working in the manhole. The worker must be protected against these liquids and vapors. Various detection devices are often used to determine whether a danger from vapor or liquids is present. When dangerous vapors are detected work may not begin until the vapors are reduced to safe levels.

The Certificate of Fitness holder must purge the manhole of dangerous vapors. Several powerful fans may be used to blow the gases away from the work location. These fans may also be used to ventilate the manhole while work is being conducted. The work area is then tested to determine the concentration of dangerous vapors in the manhole. The area must be flushed of combustible liquids. The area is flushed by washing the area down with high-pressure water hoses. Only when the work area is purged of dangerous vapor and liquids may work begin. The area should be checked periodically while work is in progress. The area should be ventilated until work is completed.

Tests must be conducted to determine the oxygen content in the manhole. Special equipment is used to assess the oxygen content. Under no circumstances should a worker be sent into a manhole if the oxygen content is below 19.5%. The only exception to this rule is when a worker is wearing a self-contained breathing apparatus. Test should be repeated as often as necessary to maintain safe working conditions.

Only approved heating devices may be used. An approval tag must be attached to each heater.

The work area must be enclosed to prevent public access. A warning sign must be posted at all manholes sites where LP Gas is used. The sign should read:

DANGER
FLAMMABLE GAS

The cylinders must be supported to prevent accidental movement. For example, they may be braced to a handtruck. Under no circumstances may the cylinders or heaters be brought into the manhole. The cylinders and heaters must be kept at least 6 feet from the manhole opening. Only two cylinders with a maximum capacity of 33½ pounds can be used for each manhole work. LP Gas cylinders must be removed from the job site at the end of the work day and can be stored overnight in a locked steel tool cart.

A 10-pound multipurpose dry chemical (or equivalent) fire extinguisher must be kept at the site at all times. It should be easily accessible in case of a fire emergency.

The entire work site must be supervised by a Certificate of Fitness holder.

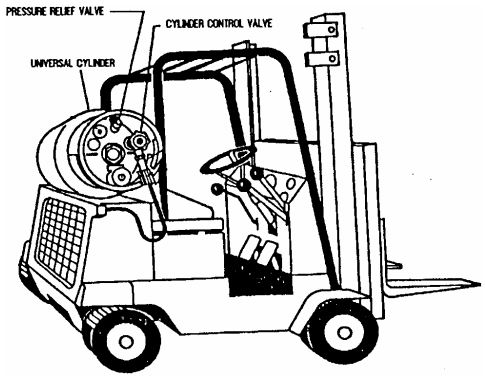
USE OF LPG IN HI-LO (FORKLIFTS) TRUCKS

Forklift trucks are commonly used in modern business and industry. For example, they are used in many warehouses and in building sites to move heavy objects from one location to another. Many of these forklifts are fueled by LP Gas. LP Gas is a convenient and economical way to fuel the forklift. The forklifts are fueled

using a removable cylinder. Only one cylinder may be installed on a forklift. The maximum capacity of the cylinder is 1½ cubic feet water container capacity (approximately 40 pounds).

Several safety features are installed on the forklift to make sure that the LP Gas is used safely. The forklift is fitted with a pressure relief valve, excess flow valves, gauges, and a regulating valve. An automatic shut off valve may also be installed on the cylinder. The automatic shut off valve shuts off the gas supply to the forklift when the flame goes out.

The cylinder or tank must be installed on the forklift in a manner that will protect it from physical damage. Usually universal type LP Gas cylinders are used to fuel forklifts. Unlike the standard LP Gas cylinders, the universal cylinders are mounted in either a vertical or horizontal position. A universal LP Gas cylinder fueling a forklift truck is shown below.



A Typical Forklift Truck

The forklift must be used and parked in well-ventilated areas. The forklift may not be parked in areas of excessive heat. The excessive heat may cause the pressure inside the cylinder to increase to a dangerous level.

A permit must be obtained to use a forklift in public areas. The permit is issued by the Fire Commissioner. The forklift must never be left unattended in a public area. Whenever the forklift is parked, the cylinder shut-off valve must be closed. The forklift may not be used or parked in the basement or cellar of any building.

Every forklift must be equipped with one 2-B-C rated fire extinguisher. The extinguisher is commonly attached to the roll bar at the rear of the forklift.

Some of the safety mechanisms installed on the LP Gas cylinder are described below.

The **Fixed Level Gauge** indicates the maximum filling level on the cylinder. It may be read when the cylinder is in either a horizontal or vertical position. It is used to make sure that the cylinder is not overfilled. It also acts as an easily read fuel gauge.

The **Pressure Relief Valve** opens to allow the LP Gas to escape into the atmosphere when the pressure is too great in the cylinder. This is a safety mechanism to prevent an explosion caused by the pressure build-up in the cylinder.

The cylinder must be securely mounted in a manner so that it is not subject to wear while the vehicle is in motion. For this reason chains should not be used to secure the cylinder to the forklift truck.

Replacing Cylinders

The LP Gas cylinders must be replaced when they are empty. No attempt may be made to refill the cylinder. It is illegal to do so. The empty cylinders used to fuel a forklift must be replaced by a Certificate of Fitness holder. The cylinder valves, hoses, and related equipment should be inspected for physical damage before replacing the cylinder. Special care must be taken to identify any potential defects that may cause a leak. Any defects that are discovered must be taken care of by repairing or replacing the defective part before the forklift may be used again.

All sources of ignition within 15 feet must be extinguished when replacing the cylinder. Cylinders should be replaced only in an outdoors location or in a well-ventilated area. The Certificate of Fitness holder must be very careful to prevent leakage of LP Gas when cylinders are replaced. After replacing the cylinder the connection must be rechecked for any leaks. Connections should be checked using a soap and water solution. The empty cylinder must be returned to the supplier. The supplier will then refill the cylinder.