UTILITIES

Table of Contents

INTRODUCTION

There are many incidents in which firefighters must operate near gas and electric utilities. If not handled properly, utilities can present hazards to both life and property. Firefighters must realize hazardous situations can be present in both fire and non-fire conditions. Pre-fire planning can be used to reduce the chances of incident occurrence and to identify the locations of the shut off valves and switches for utilities. Firefighters should be able to find all utility shut off points for any building and know how to shut off the utilities once located.

If correctly designed, installed, and maintained, utilities are both safe and useful. However, firefighters will encounter incidents that are a direct result of poor installation and maintenance. For example, improperly maintained electrical systems can cause fires by arcing and overheating. Firefighters should be able to identify the hazards associated with electrical systems and the common causes of electrical fires as well as how to safely shut off electrical utilities.

Flammable gases are subject to some of the same hazards as electricity. Gas mains that are old or incorrectly installed can rupture causing gases to be discharged. This is dangerous under any circumstances because the gas has the capability of igniting and can be difficult to extinguish. Also, gas leaking in an enclosed space can accumulate to an explosive level or as it displaces air it can suffocate the occupants. Firefighters should be aware of the procedures to decrease and/or eliminate life and property hazards associated with gas and electrical systems.

In most utility emergencies, excluding life threatening situations, the responsibility of the fire department is to call dispatch requesting assistance from the proper utility company, address any life threatening conditions, secure the surrounding area to prevent life and property hazards, and assist the utilities emergency crew upon their arrival.

In most structure fires, it is the responsibility of the Fire department to secure or shut off utilities to insure the safety of all personnel operating on the scene. Firefighters must know how to locate and safely secure the utilities during the normal course of emergency operations.

Objectives

- Describe the procedures for locating, accessing, and shutting off electric, gas, and water utilities.

- Describe the procedure for requesting utility company assistance from Dispatch.

- Describe the safeguards, which must be employed when shutting off various utilities.
- Describe the most common causes of fires started by electrical services and equipment, which would include:

a. Arcing
b. Overheating
c. Deterioration (motors, wires, appliances, cords)
d. Improper use and installation
e. Accidental occurrences
f. Defective installations or materials

- Describe the most common life safety and fire hazards of electrical services and equipment, which would include:

  a. Inadequate protection by fuses, circuit breakers, etc.
  b. Overloading circuits and wires
  c. Illegal fuse bridging
  d. Relays blocked or exposed
  e. Tampering with equipment
  f. Combustibles in electrical fixture enclosures
  g. Inadequate grounding
  h. Open electrical cabinet or box doors
  i. Inadequate clearances between electrical equipment and combustibles
  j. Broken or missing switch or receptacle covers
  k. Misuse of cords, lights, and other equipment
  l. Misuse of hazardous atmospheres

- Describe the protective measures and/or emergency procedures to decrease the threat to life and property damage for the following:

  a. Overhead wires
  b. Pole fires, or pole mounted equipment fires
  c. Victims or property in contact with wires
  d. Pad mounted transformers
  e. Underground vaults and conductors
  f. Power plants and substations
  g. Consumer installations
  h. Leaking and burning gases
  i. Attempted suicide by gas

- Describe the extinguishing operations for electrical fires.

- Describe the signs and symptoms of aluminum wiring problems.

CONTROLLING UTILITIES

Emergency Operations

One of the initial tactical priorities for the incident commander of a structure fire is to secure the building utilities to insure the safety of the firefighters. This is typically a Truck function that will be assigned as "Secure the Utilities". The firefighter given this assignment must be able to locate access and shut off the utilities as directed.

Locating Utilities

Locating utilities may often prove more challenging than first anticipated. Firefighters must use the resources available to them to assist in locating the utilities. These resources include Special Area Maps, Pre-Plans and responsible parties. If firefighters are unable to locate the utilities, a prompt request must be made to the appropriate utility for assistance with locating and shutting off the utilities.

Finding Circuit Breakers

If it is not possible to isolate the incident locally, or in the case of structure fires, firefighters should attempt to throw the switches and circuit breakers to turn off service. If no one is available to help you locate the circuit breakers or fuse box, follow the general guidelines below to find the units:

a. On underground service, look for the meter and circuit breakers.

b. On overhead electrical service look for a power pole and trace the wires running from the pole to the structure. These wires are connected to the structure by a metal mast that extends above the roofline and carries the wires to the meter. The electric meter is usually located on the mast beneath the drip loops. Do not confuse telephone and cable television wires for electric service.

c. Circuit breakers in residential and small commercial buildings are usually located in the same box the meter is on. They may be located elsewhere, but will be in the general vicinity of the meter box.

d. Residential meters are most commonly located on garages, service porches, closets and laundry rooms. Multi-family residences may have separate sub-panels located within each unit.

e. In commercial structures, the service will usually terminate in an electrical junction box that is located within a locked utility room. This room may or may not be labeled on the outside door with an "SDG&E" or telephone company sticker indicating the utilities are found within. The meter is usually located on a separate junction box with the circuit breakers and fuses directly adjacent in another panel. Typically, the meter will be labeled to indicate the box does not contain fuses or circuit breakers.

Finding gas utilities

Natural gas meters will normally be located on the exterior of the structure near the street side. If the gas meter is not located in this general area then check the entire perimeter of the structure, underground parking areas and garages. Often times the meter is hidden by plants for esthetic reasons. Occasionally the meter will be located inside of the building. In these instances there will be an auxiliary valve located in the street or sidewalk on the exterior of the structure. The valve will be located under a metal or cement cover labeled "GAS". This type of valve is called a curb valve due to its proximity to the curb. Curb valves are required at hospitals, schools, and many other structures of public assembly as a second gas shut off. In commercial or multi-family residences there may be several gas meters grouped together. In the case of liquid propane, look for the tank located away from the structure.

Finding Water Service Valves

Water service valves may be located in many different locations. Most service valves are located on the street side of the structure in a subterranean box that is easily accessible for the water company to read the meter monthly. Local valves may be located throughout the structure to control separate areas of service. When unable to locate the water service valve a prompt request should be made to the appropriate water district for their assistance.

Accessing Utilities

Accessing utilities may be as simple as opening a circuit breaker panel on a residential structure or as difficult as forcing entry through a steel clad door mounted in a steel frame to access the utility room of a commercial occupancy. When given the assignment to "Secure Utilities", firefighters must perform a size-up of the structure and determine the anticipated tools needed to complete the assignment. As a guideline, the following tools should be considered for each occupancy type:

Single-family residence:

- Pipe wrench to secure gas valve
- Bolt cutters to access padlocked gates electrical panels and gas valves

Multi-family residence:

- Pipe wrench to secure gas valve
- Bolt cutters to access padlocked gates electrical panels and gas valves
- Forcible entry tools to access locked utility rooms

Commercial occupancies:

- Pipe wrench to secure gas valve
- Forcible entry tools to access some of the most challenging doors that may be located on utility rooms. The tools needed may include: Halligan bar, sledgehammer, K-tool and circular saw. Be advised that forcing entry into commercial utility rooms may be very time consuming and require two or more firefighters to gain access. Early notification and request for the appropriate utility company to assist with securing the utilities should be considered when dealing with commercial occupancies.

Shutting Off Utilities

Once the utilities have been located and accessed they must be safely shut off as required.

Shutting off Electric Utilities

Before switching off a circuit breaker, firefighters should note the condition of the panel (i.e. circuit breakers in the "tripped" or "off" position, spent fuses, panels that have been tampered with, etc., which may aid the fire investigator in determining the cause of the fire). A quick visual inspection will usually suffice, but be wary of units that appear to have been tampered with or have exposed electrical wiring. When shutting off electric utilities care must be taken to avoid standing in wet locations and avoid any exposed wiring.

Shutting off a circuit breaker is a simple operation, move the circuit breaker switch from the "on" to the "off" position. Some electrical service panels will have a switch or breaker labeled "main"; switching this off, should shut off all power to the breakers in that panel.

Commercial occupancies will have different size service panels based upon the load they are designed to carry. Some of these service panels may have disconnects with large levers used to disconnect the power. When shutting off these services the potential for an electric arc exists. The following basic safety precautions should be utilized when securing these electrical services:

- Wear full personal protective equipment including eye protection
- Turn head and eyes away when switching off
- Stand to the side of the panel
- Assure you are standing in a dry location
- Notify SDG&E for assistance if all of these safety precautions can't be taken.

Photo illustrating proper technique for shutting off commercial electric disconnects.

Care must be exercised to avoid stranding escaping occupants (i.e. in elevators) or compromising fire operations when disconnecting the electrical service.

If difficulties are encountered while attempting to secure the electric utilities a prompt request for “S.D.G.&E” should be made through the incident commander.

Power should not be restored to occupancy without a utility company representative on-scene.

Shutting of Gas Utilities

The principal valve used for gas shut off, called a plug valve, will turn 1/4 turn in either direction to the off position. Often the plug valve has an indicator mark, which is in line with the pipe when the gas is on. When this mark line (wing) is across the pipe the gas is shut off. On some commercial services there may be a second shut off, a large valve on the low pressure or discharge side of the meter. It should only be used when you are unable to turn the gas off at the intake side of the meter. Turning this valve clockwise 1/4 turn, its maximum turning radius, will shut the service off. A large adjustable wrench should be used to turn off gas service. Street mains may contain control valves as well, but firefighters should control gas from these valves under direct supervision of the utility company. It is more appropriate to allow the utility emergency crew to operate these valves if it is deemed necessary. LPG tanks have a valve that is turned off by turning counter clockwise until closed.

Photo illustrating a natural gas meter with an adjustable wrench on the ¼ turn shut off valve

Gas service must only be turned back on by a representative of the appropriate utility due to the necessity of relighting pilot lights.

Shutting off Water Utilities

The valve located at the water meter will generally be a quarter turn valve and may or may not have a handle on it. There may be other local valves located throughout the property used to isolate the water service. Commercial occupancies may have OS&Y or gate valves located near the street that can be used to isolate water service to the structure. Care must be exercised so as not to inadvertently shut off the fire sprinklers.

Contacting Utility Companies

When firefighters encounter utility emergencies and need assistance they should, in most cases, call Dispatch to request utility assistance. The information they need to relay includes:

a. Type of utility service required (gas, electric, or water)
b. Specific location including service address and cross streets. For electrical assistance include pole, vault or transformer number if available.
c. A brief description of the problem and type of assistance that is needed. Be specific if there is an immediate life hazard so that the utility may assign an appropriate priority to the request.

WATER SERVICE EMERGENCIES

Controlling Water Service

Water damage is not only associated with hose lines and sprinkler systems but domestic water systems as well. Water lines can rupture under many different conditions resulting in significant property damage For example; a ruptured water line inside a structure can damage or destroy dry wall, carpets, personal possessions, etc. Firefighters may need to control water to avoid unnecessary damage to property. Examples include: proper operation of fire streams, shutting off local fixtures, and turning off branch street valves to fire hydrants.

There are a number of ways to control water but normally the best procedure is to close off the valve as close to the leaks as possible. This would include plumbing fixture valves, section or floor valves in large buildings, meter valves at the point of water entry to the building and street valves to shut off fire hydrants. Most fixtures (i.e. sinks, toilets, etc.) have localized shut off valves that can be easily controlled. In larger buildings, floor or floor section valves may be present but often these control valves are not labeled and are difficult to find. Firefighters should identify the location of such valves during pre-fire planning. Most structures are equipped with master control water valves that are usually located where the domestic water supply enters the building. These valves may be installed in the basement of the building or above ground. However, most master valves and the water meters are located in water meter boxes near the curbside of the structure. Street valves are also installed to control each fire hydrant, allowing the hydrant to be shut off while keeping the water main on. Water main valves should only be shut off by the appropriate water district representative.

ELECTRICAL EMERGENCIES

Classification of Voltage

For firefighting purposes, voltage can be considered in one of two classes, either high or low. As a general rule, the larger the insulator and the more insulators there are, the higher the voltage. It is important to note that both high and low voltage are extremely dangerous and capable of causing serious injury and or death. Any voltage higher than the normal residential supply (220 volts), is considered high voltage and beyond the capabilities of the firefighters to handle safely. Whenever damaged power poles, transformers, substations, or other electrical equipment is identified, it is the responsibility of the Company Officer to immediately restrict access to the area and to notify the responsible electric utility company. Anyone involved at the scene of an electrical hazard should always assume the wire or equipment is energized and proceed accordingly. If an electrical hazard is noted while operating at an emergency scene, immediately notify the Incident Commander and flag the perimeter of the hazard area with fire department barricade tape at a minimum safe distance of 25'.

UNDER NO CIRCUMSTANCES will fire department personnel "pull" electric meters or cut electric service lines.

The following procedures must be followed when confronted with a fire involving high voltage installations or equipment. This equipment may be designated by a red and black "DANGER-HIGH VOLTAGE" placard.

a. Isolate the affected area and restrict access.
b. Notify the electric utility company immediately.
c. Keep fire department personnel and water out of installations until advised otherwise by qualified utility personnel.
d. Protect all exposures.
e. Damaged energized electrical equipment should not be left unguarded.

Portable "Class C" fire extinguishers are most suited for extinguishment of fires involving energized electrical wiring or equipment.

A minimum safe distance for the application of a fog stream on any high voltage equipment (601 volts or greater) is 16'. Under no circumstances should a solid or straight stream be utilized on suspected electrical hazards.

Lights

Street lights should always be considered high voltage devices. Ornamental street lamps and overhead streetlights are often connected in series. Consequently, while the voltage input into the system is constant, the voltage in any one lamp will vary.
Neon signs operate with an electric current passing through a glass tube filled with gas. High potential voltage must be used when starting a neon lamp. Often transformers form a part of the lighting equipment increasing the electricity to as high as 15,000 volts. Although the voltage of these units is very high, the current flow is low. It is the current flow that will cause physical injury. Note: as little as one milliamp may cause ventricular fibrillation.

Emergency Procedures for Overhead Wires

Overhead wires can become hazardous when they catch on fire, sag, or fall. Firefighters should use extreme caution whenever dealing with overhead wires under any conditions particularly if one of the above occurs. In most cases, the best procedure to use when dealing with overhead wires is to call for the appropriate electric utility.

Should a vehicle become energized by fallen wires or any other means and getting the occupants clear of the vehicle is necessary, you have to make it clear, before they get out, that they are to shuffle their feet on the ground, never picking up the feet and not moving the toe of one foot past the heel of the of the other. Another method is to hop away, with both feet together, until they are at least 30 feet away from the pole….not very easy.
If the occupants are going to stay in the vehicle, they should remain in a stationary position and avoid touching anything unnecessarily. Never attempt to touch or enter an electrically charged vehicle under any circumstances. Always make sure the apparatus is not too close or touching the power lines before opening compartments, removing equipment, etc. Rubber tires will not always act as insulators, and rubber boots are not a dependable insulator.

Do not allow ladders and water streams to come near or in contact with overhead wires. Per Department policy, aerial apparatus shall not be operated closer than ten feet to charged electrical lines and fog pattern hose streams should not be operated closer than sixteen feet to charged electrical lines. A good rule is to keep personnel and equipment at least ten feet from all high voltage wires. If a ladder or water stream comes into contact with an overhead wire, it may push two wires together possibly shorting out the wires. This can cause a fire in the transformer and/or the wires can fall starting fires on the ground. Remember the induction voltage can be disrupted allowing voltage to arc between wires or travel to the ground following the reverse path of water.

Overhead wires pose a potential threat during fire ground operations. During structure and wildland fires, overhead wires may be exposed to the fire resulting in their failure and dropping to the ground. This will result in whatever they contact becoming

energized. Downed electrical wires are a very common cause of wildland fires. Engine companies must be constantly alert to the possibility of downed electrical wires and the hazards they present during fire ground operations. When downed electrical wires are encountered on an incident this information must be relayed to all assigned units through the incident commander or dispatch.

Wires Down

Upon arrival, the first-in company should call for S.D.G & E. When contacting Dispatch, the company should state the pole number and if the wires involved are from pole to pole or from pole to structure. Wires adjacent to the downed or sagging wire may have been weakened so firefighters should secure a danger zone around the incident at least one pole span from the broken or sagging wire. KEEP THIS AREA CLEAR. Any movement at the source of the trouble may cause wires to fall, burn, and/or whip. Firefighters must be extra cautious in rain conditions not to touch a wet pole and the ground when wires are down or sagging. It is possible to draw an arc and shock from a pole under these conditions.

The following guidelines are to be followed when on scene of an incident involving "wires down":

a. Notify the electric utility company.
b. Treat all wires as though they are energized.
c. Prevent entry into the hazardous area until a utility official confirms the area is safe.
d. Under no circumstances should a downed wire be left unguarded.

When a rescue problem is encountered, with the endangerment of human life, it is the Company Officer's responsibility to act accordingly based upon their knowledge of the electrical hazard and the possible results of action or inaction. REMEMBER -THINK SAFETY AND AVOID ACTIONS THAT MAY RESULT IN FIREFIGHTER INJURIES.

Pole Fires or Pole Mounted Equipment Fires

If firefighters encounter poles or pole equipment (i.e. transformers, potheads, capacitors, etc.) on fire, they should contact Dispatch to call for the electric utility. The company should then protect exposures and stand by until the electric utility personnel arrive. It may be best to let the fire burn itself out.

Oil switches, oil filled transformers and other electrical equipment containing oil (most sealed units contain oil) involve the additional hazard of oil fires. The oil used has a relatively high flash point, but it may be heated and ignited by excessive current flow or by an electric arc. Under no circumstances, should any attempt be made to extinguish this type of fire until an on scene utility representative determines it is safe (i.e. current off and grounded). After the current is shut off and grounded, such fires can be extinguished by any of the methods used for extinguishing oil fires (i.e. portable

extinguishers of the Class C type can be used effectively). Water applied with a fog or spray nozzle may also contain this type fire safely.

It is very difficult to determine whether or not a circuit is truly de-energized. Capacitors hold a charge until shorted out or grounded. This is another reason for using all precautions until an electric company crew can arrive and secure the utility.

Grade and Sub Grade Equipment

Underground electric utilities rely on grade and sub grade mounted equipment to assist in the distribution of electricity. The same hazards and precautions associated with pole-mounted equipment are present with grade and sub grade equipment. Firefighters must be alert to the possible electrical hazard posed by traffic collisions involving pad mounted electrical equipment. Often times, the vehicles may be on top of or may have knocked the equipment entirely off the pad exposing energized electrical equipment. Whenever this situation is encountered isolate the area and notify the electric utility for their assistance.

Underground Conductors

Electric cable and conductors running through underground ducts and manholes seldom cause trouble. Occasionally, however, gases and vapors accumulating in such places are ignited by outside means, or by sparks from the electrical equipment installed in them. The resulting explosion may set off a block-by block chain of explosions. Keep the areas surrounding manholes clear for several blocks on each side. The most appropriate action that firefighters can take under such circumstances is to call for utilities, perform any needed rescue work, clear the hazardous area, and stand by until the utility arrives. Firefighters should never enter an underground manhole or vault during an underground fire until the utility has deemed it safe to do so. The maximum damage will occur at the time of electrical failure and/or explosion and in most situations life hazards are minimal. To extinguish the fire, firefighters should use only non-conducting agents until clearance has been given by the utility company. CO_2 discharged into a manhole will usually extinguish smoldering and burning insulation if the manhole cover is replaced afterwards. Confined Space Entry Requirements must be considered when making entry into any space that meets the definition of a Confined Space.

Power Plants and Substations

If a fire occurs at either a power plant or substation, firefighters should not attempt to enter the plant or substation or extinguish the fire until utility authorities have been consulted. In the case of an unattended substation, the hazardous area should be secured to protect the surrounding property and the electric company should be notified. Firefighters should stay out of the substation until the utility company employees arrive.

If the fire has been extinguished by a built-in CO_2 system, this agent will probably be present in high concentration. Due to the extreme danger of suffocation, the building must be thoroughly ventilated before entry and SCBAs should always be used.

The insulating oil found in power plants and substations is a non-lubricating paraffin base oil used in transformers, circuit breakers, and other electrical equipment. It is not volatile or explosive unless heated above its flash point (294 degree F), or unless it is vaporized by an explosion. Liberated gases are very explosive and should be dealt with cautiously. Firefighting procedures are the same as for any oil fire once the system has been shut off and grounded. WARNING - While PCB's (Polychlorinated Biphenyl, a carcinogen) have been removed from all utility poles in the San Diego area, substations, schools and private structures may contain them. Transformers using PCB's must be labeled to the fact. When encountering PCB's use extreme caution to avoid contact with them and always use an SCBA. In addition, contact the Hazardous Materials Unit for assistance.

Aluminum Wiring

Because of a copper shortage in the early 1960's, manufacturers began using aluminum wiring to replace copper wiring. Aluminum, like copper, was found to be a good conductor of electricity so with high copper prices, many builders and electricians turned to aluminum wire for homes and commercial buildings.

Unfortunately, the properties and differences of aluminum wire were not discovered until the early 1970's. While aluminum expands and contracts like other metals, its contractions and expansions are greater than copper or steel. When current flows through wire, it tends to heat up, resisting the flow of electricity. Heating of the wire causes it to expand; likewise wire will contract when it cools. Aluminum wire, because of its greater contraction and expansion properties, has a tendency to work loose from its connections. The resulting loose connections generate heat when current is flowing, enough heat to start a fire.

Another problem with aluminum wiring is the build up of aluminum oxide on the outside of the wire. When aluminum is exposed to air, a film of aluminum oxide will readily form on the metals surface. The oxide is an insulator and will inhibit the flow of electricity. Like the previous scenario, when the flow of current is impeded, a great amount of heat is generated, enough to start a fire.

Aluminum wire was widely used between 1965 and 1973. If firefighters encounter an incident where the house was built or rewired during those years, they should suspect faulty aluminum wiring. Look for exposed runs of wire in the attic or garage area. The letters "AL" or the word "aluminum" will be stamped on the insulation covering of the wire. When inspecting homes and buildings or during pre-fire planning, firefighters should look for the following signs/symptoms of aluminum wiring:

a. Flickering lights, static in radios and/or TV's.

b. Odors and/or smoke coming from around electrical outlets.
c. Cover plates on switches or outlets that are warm to the touch.
d. Smoke, sparks or arcing at the switches or outlets.
e. Strange odors such as the smell of plastic.
f. Receptacles or entire circuits that do not work.

If these signs/symptoms are encountered the responsible party should be instructed to contact a qualified electrician for evaluation of the wiring.

GAS EMERGENCIES

Introduction

Natural gas and Liquid Propane Gas (LPG) are flammable gases. Many households and commercial buildings utilize these gases for everything from heating to industrial processes. The objective of firefighters is to contain incidents involving natural gas or LPG, keeping damage to a minimum. The hazards of gases are twofold, they have the ability to displace air, causing suffocation in enclosed spaces and they are highly flammable. Firefighters should be aware of the differences and similarities between these gases and methods utilized in their distribution. When firefighters encounter incidents where natural gas is a suspected danger they should call Dispatch for utility (gas) assistance. When encountering an LPG incident, firefighters may wish to contact the Hazardous Material Response Team for assistance.

Natural Gas

Natural gas is odorless, colorless, nontoxic and is composed mainly of methane with small quantities of other gases added. Though methane is nontoxic, it is considered an asphyxiant because of its air displacement capabilities. An odor has been added to natural gas that is noticeable at one percent presence in a volume of air.

Natural gas is 35 percent lighter than air, so as it displaces air it will rise. Firefighters should be cautious of this when ventilating a room (i.e. always ventilate as high as possible). When using a gas detector, always put the sensing element at the highest point.

Distribution and Supply

Natural gas is distributed through pipelines with a pressure range of 1/4 to 1,000 psi. Usually, the pressure is kept below 50 psi for distribution in residential areas. Polyethylene pipes are only used underground and are usually placed in common ditches (in the street near the curb) with electric lines, cable TV, and telephone lines.

Liquefied Petroleum Gas (LPG)

LPG is usually composed of butane and/or propane. This gas is similar in nature to natural gas in that it is nontoxic, colorless, asphyxiating, and odorless (an odor has been added to identify LPG presence). During transport, the added odor may not be present and firefighters should always be cautious when approaching incidents where hazardous materials are suspected.

LPG is 1-1/2 times heavier than air and tends to remain in low places due to its heaviness. This makes LPG dangerous in both enclosed spaces and in areas such as ditches. LPG is typically stored in cylinders above ground. Examples include:

residential homes, industry, vehicles, and house trailers. The shut off valve for LPG is located on the storage tank (container).

Flammability of Gases

Both LPG and natural gas are highly flammable. The difference between them is their flammable limits. Natural gas is explosive in concentrations of 4 to 14 percent. LPG is explosive from 1.5 to 10 percent of air volume. At these percentages, these gases can be ignited very easily. The explosive potential is significantly reduced when the gases exceed their upper explosive limit. Note: The gas is still dangerous above this limit. LPG cylinders have the added danger of a BLEVE (Boiling Liquids Expanding Vapor Explosion) when the tank is half full or less and exposed to intense heat or flame. In most cases, LPG is stored in tanks near the area of use and then piped to the appliance(s) it services. The ignition point for LPG is from 750 to 1,000 degrees F, natural gas is higher at 1,000 to 1,200 degrees F. When these gases burn, they produce very little smoke with intense radiant heat.

Protective Measures during a Gas Emergency

There are several different types of incidents that may occur involving gas. Firefighters should consider the following operating procedures when encountering an incident involving gas. Always advise Dispatch to notify the gas company whenever natural gas is involved. If LPG is involved and depending on the size of the incident, it may be wise to ask for assistance from the Hazardous Material Response Team. There are basically five situations firefighters will encounter where gas is of concern:

a. Escaping gas outside
b. Burning gas outside
c. Escaping gas inside
d. Burning gas inside
e. Attempted suicide

Escaping Gas Outside

If gas is escaping from the ground, an excavation, open pipe, manhole, sewer, or a vault, firefighters should isolate the area for safety by barricading or roping it off. Firefighters should eliminate possible ignition sources by:

a. Prohibit smoking
b. Stop all machinery
c. Reroute vehicular traffic
d. Contain all electrical switches (they must not be operated)
e. Avoid any conditions that can cause sparks

Firefighters should check surrounding buildings, including basements, for the presence of gas odors. Always call the utility company at such incidents. The utility company can

give specific information as to whether the gas is combustible and usually can tell if it is natural gas, sewer gas, gasoline vapors, cable burnout gas, etc. The utility company may also be able to determine the source of the leak. Firefighters must always use SCBAs and full turnouts when dealing with gas incidents. The gas may have fully displaced the air causing asphyxiation to individuals that do not have an alternate source of air. Full protective equipment is also necessary to protect against possible flash fires or explosions.

Burning Gas Outside

If gas is burning outside, do not extinguish the fire. The burning gas reduces the hazard of the escaping gas. Notify Dispatch for utility assistance. There is no danger of explosion but the area should still be isolated for safety and exposure lines placed into service. If there are exposures to the fire, they should be protected (i.e. water streams).

Escaping Gas Inside

If gas is escaping inside a structure, firefighters should evacuate the area and eliminate possible ignitions sources. Depending upon the severity of the gas leak, the leak should be secured at the most appropriate valve. Full protective equipment with SCBA is required to protect against flash fires and explosions. Minor leaks with a low concentration of gas should be shut off as close to the leak as possible. For example, if a minor gas leak is encountered at an appliance, the service cock or valve at the appliance should be turned off. If the gas leak is significant with a high concentration of gas encountered, entry into the area should be limited and the leak secured at the meter or other safe exterior location. Situations will be encountered in which you are unable to secure the gas leak due to damage or system design. In these situations, all personnel should be aware of the possibility for a significant explosion and take appropriate actions including immediate notification of the gas utility company for their assistance.

Once the gas leak has been secured ventilation of the area should occur. Ventilate nearest to the highest concentration of gas first, and then depending on whether you are dealing with natural gas or LPG, ventilate accordingly (i.e. start high for natural gas and low for LPG Remember, always wear full protective clothing and use your SCBA's.

When a firefighter turns off a gas valve - LEAVE IT OFF – request a utility company representative to the scene. Only a utility company representative should turn a gas valve on after it has been shut off.

Burning Gas Inside

If gas is burning inside a structure, shut off the gas at the meter or outside at the curb valve. Once the gas is secured treat any remaining fire as an ordinary structure fire. If the gas supply cannot be safely shut off, keep the surrounding combustibles wet with a hose stream, but do not extinguish the gas fire until the utility company can control the

gas flow. Allowing the gas to burn will eliminate a possible explosion hazard and allow you to control the fire until the arrival of the utility representative and the gas being shut off. Often times, a structure fire will cause damage to the gas supply system and will result in a gas fire inside of the structure. In these situations, the same procedures should be followed.

Attempted Suicide

Firefighters may encounter situations where an individual is attempting suicide via natural gas. The odds are that by the time you arrive, the gas in the confined space is over the explosive limits of the gas. The individual inside may be waiting for a pilot light or cigarette lighter to ignite the gas. Do not ventilate the enclosure. Usually, the person will close up the area as tightly as possible and efforts to ventilate may allow the gas to dissipate to explosive levels. Efforts to ventilate may also cause the individual to panic and take some undesirable action. In suicide cases, upon arrival, the first step is to shut down all services. This will extinguish pilot lights and shut down electrical switches, eliminating these sources of ignition. Do not attempt to enter the building. If the police decide to enter, have them do so by opening and closing an entrance as quickly as possible. When there are no longer occupants inside the building, ventilate it carefully from the outside.

In all situations with gas leaks, the potential for a significant gas explosion must be realized and appropriate personal safety equipment utilized and appropriate procedures followed.