Travis County Emergency Services District No. 9
Westlake Fire Department

Standard Operating Procedure

Subject: **Natural Gas and Propane Emergencies**

Effective Date: **June 15, 1997**

Authorized By: **Chief Paul Barker Revised Date: November 27, 2000**

I. Purpose

To establish procedures for the response to natural gas and propane emergencies.

II. Policy

It shall be the policy of the Department to limit our natural gas and propane response activities to isolation, evacuation, and the suppression of fires ignited by burning gas. A natural gas or propane gas leak shall be considered a "Still Alarm" unless the gas has ignited. In the case of an ignition, the alarm shall be upgraded to regular alarm. If additional personnel are required for isolation, they shall respond Code 1 from their location. Members of the Department shall not attempt to extinguish a flame supported by a gas leak until the gas company is ready to enter the hot zone and cap / plug the line.

III. Background

Natural gas is the most common of all fuel gases. Methyl Mercaptan is used to Odorize" natural gas in most residential and commercial services. Mercaptan is heavier than air, and commonly starts to “fall out" of natural gas when it is released from its container or pipeline. As this chemical separates from natural gas, it is sometimes detectable in places where there is no natural gas present.
There are two times when natural gas is not odorized: when it is transported via interstate pipeline and when it is stored as a cryogenic fluid. Odorant is added locally before it enters the distribution system. Natural gas is stored and transported in three ways: 1) as a gas in pipelines, 2) as a gas in high-pressure containers, and 3) as a cryogenic liquid in insulated\refrigerated containers. Each container represents a different type of hazard.

Vehicles fueled by compressed natural gas (CNG) can be identified by a blue and silver diamond-shaped decal displaying the initials "CNG." This decal will appear on the right rear of the vehicle. Vehicles fueled by Liquefied Natural Gas (LNG) can be identified by a black and silver diamond-shaped decal displaying the initials "LNG." It will appear on the right rear of the vehicle. LNG-fueled vehicles are required to have an on-board gas detection system.

III. Procedure

The following procedures will be followed when responding to natural gas releases of any type:

- Approach the emergency from upwind
- Evacuate the immediate area
- If the release has not ignited, use banner tape to secure a Hot Zone of sufficient size and configuration to ensure that ignition will not occur from outside sources and eliminate all potential sources of ignition in the Hot Zone.
- Monitor the perimeter of the Hot Zone with direct reading instruments to ensure that at no time does a gas/air mixture exceed 10% of the lower explosive limit.
- In those cases where ignition has occurred or is likely to occur, provide baselines of sufficient capacity to protect any exposures that are within the Hot Zone.
- Require that any person entering the Hot Zone be equipped with the proper protective gear.
- Provide fire protection and rescue standby for those entering the Hot Zone.
- Control of the leak and control of ignition sources are the two most important considerations for natural gas emergencies.

B. Control of Natural Gas Leaks from Pipelines

- Evacuate persons from an area immediately surrounding the site of the leak.
- Secure a safe Hot Zone perimeter around the leak site. The following rule-of-thumb formula should be applied to determine the size of the hot zone:

Diameter of gas pipe (in inches) x 8 + 40 = Hot Zone radius in feet

- For pipes 8 inches or larger, evacuate a radius of 150 ft. because of the radiant heat that would be produced in case of ignition. When Direct Reading monitoring equipment arrives on the scene, check the perimeter of the Hot Zone and expand it, if necessary, so that at no time will an area outside the Hot Zone have a reading in excess of 10% of the LEL. When sufficient personnel become available, establish a secondary exclusion zone at a distance where readings do not exceed 1% of the LEL. Instrumentation carried by the Southern Union Gas Safety personnel may be used to establish these perimeters (some SUG equipment measures in PPM).
- All potential sources of ignition shall be eliminated from the Hot Zone.
- When there is an exposure in a Hot Zone, whether structural, mechanical, or workers entering to control the leak, protective hose lines shall be put in place to protect these exposures.
- Any person entering the Hot Zone will do so only after receiving permission from the IC or his/her representative. WFD personnel entering the Hot Zone will wear, as a minimum, full turnouts and SCBA.
- A back up or rescue crew will be assigned to standby a reasonable distance when personnel are working in a Hot Zone to control a leak.
- WFD personnel may take action to plug or crimp small natural gas lines provided they have the proper equipment and training.

C. Control of Fires at Natural Gas Pipelines

- Evacuate and secure an area of sufficient size to prevent injury to the public.

- Provide baselines with sufficient volume to protect exposures within the area affected by radiant heat from the fire. DO NOT ATTEMPT TO EXTINGUISH THE FIRE!
- Assist Gas Co. personnel in shutting off the source of the gas.

D. Control of Leaks From High Pressure Containers:
- Evacuate the immediate area and establish an initial Hot Zone with a radius of 50 ft. Static charges generated by high-pressure leaks can cause ignition at any time.
- If Direct Reading monitoring equipment is available, establish a Hot Zone at 10% LEL and a secondary exclusion zone at 1% LEL.
- Eliminate any source of ignition.
- Put protective baselines into place.
- If a sufficient number of properly trained and equipped personnel are available, provide a backup crew and close the valves that will control the leak.

E. Control of High Pressure Natural Gas Containers
- Evacuate and secure an area of sufficient size to prevent injury to the public in the unlikely event of a container rupture.
- Provide baselines to protect exposures that are affected by radiant heat. Do not attempt to extinguish the fire—high-pressure tanks will exhaust themselves fairly quickly. Their fusible plug melts at 212F, and it is not possible to close a tank after this has happened.
- If a sufficient number of properly equipped and trained personnel are available and the situation will allow it, shut off any valves that may be feeding the fire from other containers via a manifold system.

F. Control of Leaks From Cryogenic Containers
1. There are several factors that significantly effect response to an incident involving a cryogenic container containing natural gas:
   - Cryogens are stored at temperatures below -260 F. and any contact with this liquid will cause severe frostbite injury.
   - When cryogens are released from a container, they have tremendous expansion ratios, often in excess of 600 to 1. This means that one cubic foot of liquefied natural gas, when released, can produce 600 cu ft of 100% gas vapor and a flammable vapor cloud in excess of 12,000 cu ft.
   - Liquefied natural gas does not have odorant; the only way to establish its presence is by **direct reading flammable-gas detectors.** A vapor cloud will sometimes be present near the container when it is released, however this vapor cloud DOES NOT indicate the boundary of the flammable gas cloud.
2. The following are steps that should be taken to control a leak from a LNG container:
   - Immediately evacuate a Hot Zone with a 75 ft radius around the leaking container.
   - When direct reading monitoring equipment becomes available, establish a Hot Zone at 10% of LEL and a secondary exclusion zone at 1% of LEL. Because of the high expansion ratio and cold temperature of LNG, the downwind exclusion distance may be much larger than those experienced with compressed natural gas.
   - Eliminate all ignition sources in the Hot Zone.

- Provide for exposure protection, **DO NOT** spray water on the container or any spilled liquid, this will heat the container or the spilled LNG and cause the volume of the gas vapor released to increase.
- Any person entering the Hot Zone should, in addition to full protective clothing and SCBA, be provided with thermal protection against the extremely cold temperatures that may be encountered in the area of the leak. Provide fire protection and rescue standby for any workers entering the Hot Zone.
- Only qualified personnel from the facility or WFD trained HazMat personnel should attempt to approach the leak or take actions to mitigate the situation.

G. Control of Fires Involving Cryogenic Containers
- Immediately evacuate a Hot Zone with a radius of 75 feet.
- Provide exposure protection for flame impingement on the tank and for surrounding exposures.
- Do not extinguish the fire except by shutting of the fuel.
- If the fire can be extinguished by shutting off valves etc. initiate this operation if it can be done safely.
- Require that HazMat Team members entering the Hot Zone to control the fire have proper protective clothing.
- Be sure that back up lines and rescue standby are in place before any entry is made into the Hot Zone.

H. Control of Gas Releases Inside Structures
- Because structures provide containment that will allow natural gas concentrations to build to the LEL, they must be handled with extra care:
  - Immediately evacuate the structure, if it is necessary to enter the structure to rescue occupants, full protective clothing and SCBA must be worn.
  - Do not allow occupants to operate electrical switches in the structure. This can produce an electrical arc that may cause ignition of the gas.
  - Lay hose lines of sufficient size to extinguish the structure and protect exposures should ignition occur.
  - Shut off the gas supply at the meter.
  - Open the doors of the structure and initiate positive pressure ventilation from upwind.
  - Continue ventilation until direct reading combustible gas meters indicate that there is no flammable gas in the structure.
  - Notify the gas supplier that there may be defective equipment or piping involved and that a leak test should be performed before the gas service is restored.

I. Fires Involving Natural Gas Inside Structures
- Protect exposures and fight fire as per WFD S.O.P.
- While lines are being put into place, shut off the gas at the meter.
- Notify the gas supplier that the incident may have involved natural gas.