NATURAL GAS EMERGENCIES

The Phoenix Regional Automatic Aid System responds to thousands of incidents each year that involve natural gas. We must remain cognizant of the hazards associated with gas emergencies, the need to meter, control gas leaks and evacuate those threatened. Most important of all, we must remain vigilant and prevent complacency.

Natural gas (Methane) is extremely flammable, lighter than air, is colorless and odorless. Due to these characteristics, Mercaptan is added to natural gas to help indicate its presence and will result in an odor like rotten eggs. The flammable range of natural gas is 4 percent Lower Explosive Limit (LEL) to 15 percent Upper Explosive Limit (UEL) by volume. Although natural gas is non-toxic, it can displace oxygen, which can cause asphyxiation in certain settings. The presence of natural gas in its flammable range can be evaluated with the use of a Combustible Gas Indicator. This is done by the Hazardous Materials Response Teams (HMRT) and/or the appropriate utility company.

Fires involving natural gas should be controlled by stopping the flow of gas. In most cases, burning natural gas should not be extinguished as this would change the situation from a visible to an invisible hazard with an explosive potential. Because natural gas is lighter than air, if confined it has the potential for a catastrophic explosion. Natural gas leaks above ground are much easier to manage than below ground leaks.

PROCEDURE

Fire Department units may encounter natural gas in a variety of situations and incident types, each presenting a unique set of hazards. These incidents can range from a simple check odor to potential major incidents involving natural gas explosions. The following guidelines present an approach which will be applicable in many situations, but do not replace good judgment and experience when dealing with any incident. Incidents involving natural gas should be managed using the risk management profile and strategic decision-making model (M.P. 201.01C).

PERSONNEL SAFETY

Per M.P. 202.05B, all personnel working in the vicinity of a potential explosion or fire area, including gas leaks and fuel spills, shall wear full protective clothing with SCBA, face piece donned and breathing air. A Hot Zone shall be established and defined by "fire line" tape. Personnel working in the hot zone, (e.g. attempting to secure a gas leak), shall be protected by a hose line. The number of exposed personnel will be kept to a minimum while still assuring crew accountability and a minimum of two personnel.

ACTIONS OF THE FIRST ARRIVING FIRE DEPARTMENT UNIT (NON HAZ-MAT)

- Perform a scene size up and establish Command. Consciously avoid committing apparatus or personnel to a dangerous situation or a situation that could become dangerous due to gas migration.
- Attempt to locate the homeowner or other RP and begin to gather information as to the hazard, potential victims, etc.
- Evacuate the area, working towards an "All Clear" of the immediate area and surrounding structures if necessary.
- Isolate the area/scene – Establishment of a "Hot Zone" is critical.
- Deny entry.
- If incident is determined to be a natural gas leak, ensure that personnel safety practices are in place when working in the Hot Zone including the wearing of the appropriate PPE with SCBA, face piece donned and breathing air. Establish a water supply and ensure that a charged hose line is in place. This line must be attended when Haz-Mat crews or gas company personnel are securing the leak.

ACTIONS OF THE FIRST ARRIVING HAZ-MAT UNIT

- First arriving Hazardous Materials Response Team should be assigned Hazard Sector
- Ensure that firefighter safety practices are in place when working in the Hot Zone, including wearing the appropriate PPE with SCBA face piece donned and breathing air.
- Ensure that a charged hose line is in place and manned when Haz-Mat crews or gas company personnel are securing the leak.
- Contact initial crews, the RP, and gas company personnel (if on scene) to gather information about the hazard.
- Reevaluate the initial Hot Zone using metering devices, including Combustible Gas Indicators (CGI), and adjust the boundaries as necessary based upon the situation and meter readings.
- Gather necessary tools and equipment needed to mitigate the hazard.
- In situations where gas company personnel are needed to assist with the mitigation efforts, ensure that they are dressed in the appropriate PPE including SCBA's.

INCIDENTS INVOLVING A REPORTED GAS LEAK - NO FIRE OR EXPLOSION

Calls for "odor of gas," "gas leak," "broken gas line" and similar situations may range from minor to major incidents. Each of these scenarios should be approached as

potentially dangerous situations. Although there is not a visible hazard, fire or explosion, the situation can change instantly. Uncontrolled flammable gas leaks should never be approached with a "routine" mindset. Safe and effective operations necessitate appropriate size up, approach, establishing and controlling the perimeter, and hazard mitigation.

In all cases, Fire Department units shall take appropriate actions, using the Risk Management Profile (M.P.201.01c) to provide for life safety and property conservation.

If gas company personnel are on the scene of an incident prior to arrival of fire crews, the best practice is for the first arriving Fire Department unit to make contact with the on-scene gas company and determine needs. Gas company personnel shall be responsible for locating and eliminating the source of the leak. Gas company personnel and/or the Hazardous Materials Response Team shall obtain a sufficient number of gas concentration readings, using various tools, including combustible gas indicators for Command to evaluate the hazard and take appropriate action.

The Hazardous Materials Plan (M.P. 204.01) should be used as a basic guide for these incidents. A minimum number of personnel should be allowed to enter the area to size-up the situation while any additional unit's stage outside the hazard zone, preferably up wind of the incident.

In addition to evacuating, isolating, and denying entry, non-tech fire crews can attempt to locate the source of the gas and any shutoff devices available.

- If the location of the incident is a **SINGLE-FAMILY DWELLING** and the source of the leak can be identified it would be appropriate to secure the gas to the appliance or meter if needed. Wait for the arrival of Haz-Mat crews if a source of the leak cannot be located.

- If the location of the incident is a **COMMERCIAL OCCUPANCY OR OTHER LARGE OCCUPANCY** (e.g. large warehouses, hospitals, etc.) refrain from attempting to secure the natural gas unless there is an immediate life hazard. Securing the gas main is often difficult to accomplish due to the size and complexity of the occupancy. Best practices should include evacuation, isolation, and the denial of entry until Haz-Mat crews and/or gas company personnel arrive on scene.

- If the location of the incident involves an **APARTMENT COMPLEX**, the best practice is to try and determine the source of the leak. If you can isolate the leak at an appliance, secure the source, (e.g. incoming gas line at the dryer or stove). If the leak is at a bank of meters, best practices should include evacuation, isolation, and the denial of entry until Haz-Mat crews arrive on scene.

Gas leak situations within a building where the source of the leak is unknown or uncontrolled, the gas supply should be shut off at the meter. This should only be done in coordination with on scene HazMat units, C957 or Gas Company representative.

If there is any indication of gas accumulating within a building, evacuate occupants from the structure, isolate the area and deny re-entry and await the arrival of HazMat units. Attempting to secure ignition sources, e.g. turning off power, can lead to an explosion. If there is imminent life safety concern, use the appropriate actions necessary following the Risk Management Plan (M.P.201.01c).

First arriving Hazardous Materials Response Team (HMRT) should be assigned Hazard Sector and should initiate metering the area to re-evaluate the established Hot Zone boundaries. Hazard Sector will assess their ability to mitigate the leak. At this time Hazard sector should work with other utility companies to secure ignition sources including electricity. Securing electricity may not take place onsite but at a remote location. Hazard sector should consider ventilating the structure using natural ventilation and/or intrinsically safe equipment if available. Battery operated equipment does not necessarily mean intrinsically safe.

Hazard Sector should work with the gas company to obtain sufficient number of gas concentration readings in the event the leak has not been identified. If gas company personnel are actively securing the leak in the HOT ZONE, fire department crews shall provide stand-by protection with a charged 1 ¾ hand line and minimum of two firefighters in appropriate PPE with SCBA, face piece donned and breathing air.

Operating personnel should remain pessimistic in their approach to reported gas leaks and should utilize HMRT crews and the utility company resources to rule out any potential hazards.

INCIDENTS AT WHICH AN EXPLOSION OR FIRE HAS OCCURRED

Units arriving at the scene of a structural explosion must consider natural gas as a possible cause and recognize the potential signs including a debris field, and/or structural damage.

Explosions have occurred in structures which were not served by natural gas. Underground leaks may migrate considerable distances before entering a structure through the foundation, around pipes, or through void spaces. When natural gas migrates in this manner, Mercaptan may be scrubbed as the gas travels underground leaving the gas truly odorless. In these circumstances, the cause of the explosion may be difficult to determine.

First arriving crew should perform the following:

1. Effective size up, recognize the signs of a gas explosion.
2. Determine the presence of victims, their condition, and triage.
3. Identify immediate hazards (e.g., collapse, leaking gas, fire, etc.).
4. Develop an incident action plan, consideration given to the need for rescue of trapped occupants, structural collapse and/or integrity, treatment, fire control, etc. Also, address accomplishment of an "All Clear" on involved structure and surrounding structures (evacuation).

Until it can be determined that the area is safe from the danger of further explosions, evacuate all civilians and keep the number of Fire Department and/or other emergency personnel (e.g., gas company) in the area to the minimum number necessary to stabilize the situation. Take a pessimistic point of view.

The Incident Commander must establish a Hazard Sector as soon as possible. Hazard Sector should establish Hot, Warm, Cold, and No-Entry Zones as necessary. The Hot Zone should include any areas where gas detection equipment identifies reading of 10 % of the LEL (0.4% gas) or greater. If a gas concentration is encountered inside, adjacent to, or underneath any building, secure all possible sources of ignition in the affected area. HazMat crews will, in coordination with utility company personnel, secure electricity from outside the affected area to avoid arcing if necessary. Before securing any potential ignition source, evaluation and metering should take place. Hazard Sector should consider ventilating the structure using natural ventilation and/or intrinsically safe equipment if available. Battery operated equipment does not necessarily mean intrinsically safe.

Use combustible gas indicators to systematically check all suspected areas. Start outside of the area of the explosion and move into the area until readings indicate detectable concentration. Both gas company personnel and the HMRT will establish warm and hot zones.

The use of ground probes is essential to evaluate potential underground leaks. However, in extraordinary circumstances, such as migration of gas in a sewer system, ground probes may not be sufficient and other detection devices may be required. When gas company personnel are on the scene, ground probe readings and locations must be coordinated.

Command shall provide for effective interaction between gas company personnel and the Fire Department. Gas company personnel are responsible for locating and eliminating leaks in the gas system. As industry specialists, they can provide Command with valuable assistance in the effective handling of these incidents. In all cases, C957 or Haz Mat Company Officer, will be required to supervise during on-site operations.

Command must ensure the safety and stability of all involved structures. If further collapse is possible and a life safety hazard exists, Technical Rescue Teams and other specialty resources should be called to provide for structural stabilization. Additional appropriate resources should be requested as needed. (e.g., C99 should be dispatched and structural engineers requested if necessary).