

SCENARIO - Natural Gas Distribution Emergency

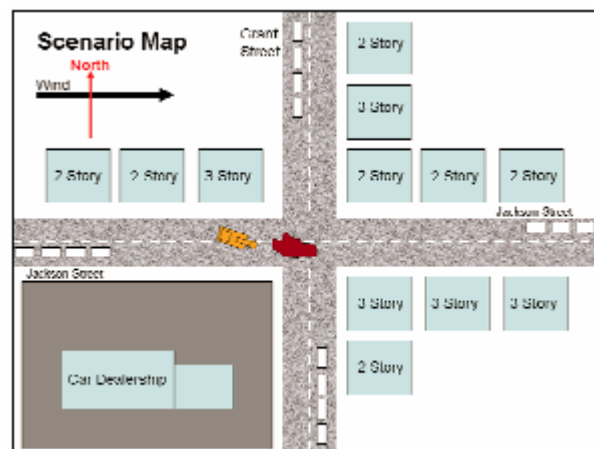
PUNCTURE OF A WATER AND GAS PIPELINE IN A RESIDENTIAL NEIGHBORHOOD MADE UP OF MULTI-FAMILY TWO AND THREE STORY APARTMENTS.



Photo Courtesy of Rick Vanski

Background

On a weekday morning around 10:00 am, the community emergency dispatch center receives a call from several bystanders on their cell phones. They are standing at the intersection of Jackson and Grant streets and smell the odor of natural gas. The dispatch center receives another call from a construction worker at the same intersection. While excavating a water line, he punctured an adjacent gas pipeline. The dispatcher sends a full structure response for the call, consisting of two engines, a ladder company and a chief officer.



The construction company has evacuated the area and they are trying to stop traffic in both directions. Many of the stopped vehicles are still occupied with the engines running. A crowd of bystanders has gathered before the chief and the first engine arrive on the scene. Upon arrival, the chief officer observes water and gas expelling from the excavation.

Some questions for consideration?

- **What are your initial operations?**
 - Where would you position the apparatus and personnel in this emergency?
 - What do you consider the safe perimeter area?
 - Will the wind affect the response?
 - What are the clues to the presence and size of the natural gas leak. Are there any visible indicators?
 - Where will the gas accumulate?
- **Strategic and tactical considerations**
 - What would your incident action plan include?
 - What strategic goals would you establish?
 - What tactics would you take to accomplish goals?
 - How and when do you interface with the operator of the natural gas pipeline?

INCIDENT ACTION PLAN

The initial tactical actions are to (1) isolate and deny entry to the area of the release. (2) begin public protection actions (3) gather more information for risk assessment (3) contact the local utility company for assistance.

Summary of Actions

The Incident Commander (IC) adopts a strategic mode and sets initial strategic objectives in accordance with established procedures. In natural gas emergencies, gas company employees may be on scene before the fire department (FD) or police in response to a gas odor call. The IC should immediately establish contact with the gas company to enlist their experience and resources to respond to the gas pipeline rupture. Initially, the mode appropriate for a natural gas leak is defensive, since most pipeline ruptures require tactical actions such as evacuation, air monitoring, and exposure protection.

The IC establishes a command post upwind of the rupture and coordinates all the players in this event. The IC establishes a security perimeter and determines if bystanders and occupied vehicles are safe. Based on the severity of the rupture and the congested nature of the incident site, the IC determines further evacuation is necessary. The IC requests additional FD and police units to assist with evacuation and site management. The IC requires the additional units to travel a path to the incident that avoids areas where gas may be accumulating.

The IC evacuates all buildings on at the intersection of Grant and Jackson. The down wind buildings along Grant and all stopped vehicles were also evacuated. All stopped vehicles were turned off to minimize potential ignition sources. All bystanders are moved back two blocks.

After completing these public protective actions, the IC attempts to quantify the hazard posed by the pipeline rupture. If gas company first responders are on the scene, they may have already collected data relevant to quantifying the hazard. If no data has been collected, first responders need to wear full protective clothing and SCBA before entering potentially hazardous areas. The responders use a calibrated "four gas" (CGI, Oxygen, H₂S/Hydrogen Sulfide and Carbon Monoxide) direct reading combustible gas indicator to determine if the area surrounding the excavation is dangerous or explosive. When flammable gas concentrations over 10% of the lower explosive limit are detected, the building or area is evacuated.

The IC also considers additional means to minimize the possibility of ignition. The IC contacts the local electric company to plan for the deactivation of the electric system in the vicinity of the pipeline rupture. The water company must also be represented in the incident command post to coordinate response to the water line leak.

By this point, the FD will likely have been joined by gas company first responders. Four-gas readings can be confirmed by the gas pipeline company and the responders can maintain their defensive positions while the gas company stops the flow of gas to the leak. Once the gas company has eliminated the leak and all structures are confirmed to be free of gas, the incident scene should remain undisturbed until the site conditions are documented by an investigating agency.

Comments and Observations

Natural gas is odorless and colorless, so odorants like tertiary butyl mercaptan is added to provide the odor commonly called "gas". However, even if there is no odor present or there is an odor, and responders are worried that a dangerous concentration is present, they must use a direct reading instrument like a combustible gas indicator (CGI) or a gas company flame ionization detector (FID) to determine the flammability hazards. Most CGIs and flammable gas detectors are set to alarm at 10% of the LEL of the gas upon which the sensor is calibrated (approximately 4000 ppm). In the natural gas industry, virtually all CGIs and flammable gas sensors are calibrated on methane. The local responders should work with their utility company to determine an appropriate concentration of the LEL for action criteria based on readings.

Natural gas may follow disturbed soil and enter into basements and below grade areas around the pipe or other venues.

The flammability range of natural gas is 4% to 15% in air by volume. Controlling ignition sources is a priority. Some examples you may not have thought about are:

- Doorbells
- Flashlights
- Telephones

- Burglar Alarms
- Heating Systems
- Vehicles and Trucks
- Pagers
- Light Switches
- And Garage Door Openers



Full turnout gear must be worn at all times until the atmosphere is established to be safe. This includes SCBA, hood, and gloves. Remember - protective clothing is your last line of defense. Avoid entering atmospheres when flammable gas is present. Emergency responders have been seriously burned and injured in scenarios just like this because they didn't use their protective clothing and equipment.

STREET SMART TIPS FOR GAS EMERGENCIES

- **NATURAL GAS IS EXTREMELY FLAMMABLE.**
- *With any leak, always anticipate and expect that ignition will occur*
- *Natural gas released inside buildings presents one of the greatest flammable hazards to emergency responders. Buildings full of natural gas should only be approached when needed with extreme caution and with a minimum number of personnel.*
- **CAUTION: Natural Gas / Methane (UN1971) is lighter than air and will rise.**
- **DO NOT** close main valves or any other large transmission or distribution valves.
- This can lead to serious problems elsewhere in the natural gas pipeline system. FD should not close any valve upstream of the meter or service line curb valve.
- Upon ignition, vapors will burn back to the source of gas.
- Vapors may cause dizziness or asphyxiation.
- Establish an effective and safe perimeter
- Position apparatus out of danger zone (avoid front of building and over manhole covers and sewers)
- Secure the scene and deny entry
- Evacuate the public to a safe distance
- Contact and coordinate with the gas operator, electric company, and other utilities that may become involved in the incident

- Wear positive pressure self-contained breathing apparatus (SCBA) as well as full structural firefighter protective clothing. Structural firefighters' protective clothing will only provide limited thermal protection
- Monitor the atmosphere, using multiple monitors where possible.
- Monitor for gas traveling away from source toward exposures
- Control ignition sources (smoking, open flames, internal combustion engines and motors)
- Do not operate electric devices such as switches, etc. Sparks could cause ignition.
- If you can do so without danger, stop or control of the gas release at the appliance, or service meter valve.
- If safely possible, ventilate the area, keeping in mind that during this process, if the flammable atmosphere is above the UEL the gas may pass back through the flammable range of 4% to 15% gas to air.
- Use protective hose streams to approach if necessary.
- Closed valves must remain closed until opened by gas utility personnel

For More Information:

U.S. DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) has issued an Advisory Bulletin to pipeline operators addressing emergency planning and coordinating with utility owners. The Advisory Bulletin is available at: [http://primis.phmsa.dot.gov/comm/publications/Fire Service Bulletin Glenpool FINA L 2006-07-27.pdf](http://primis.phmsa.dot.gov/comm/publications/Fire_Service_Bulletin_Glenpool_FINA_L_2006-07-27.pdf)

For more information on NASFM's Pipeline Emergencies programs please visit:

Pipeline Training
<http://www.pipelineemergencies.com>
 Or call 877-627-3605

References:

Hildebrand and Noll, Pipeline Emergencies, Red Hat Publishing, Chester, MD 2004- Developed for DOT Pipeline Hazardous Materials Safety Administration (PHMSA) and the National Association of State Fire Marshalls (NASFM)

Noll, Hildebrand and Yvorra, Hazardous Materials - Managing the Incident, 3rd Edition, Red Hat Publishing, Chester, MD 2006

Michael Callan, Responding to Utility Emergencies, Red Hat Publishing, Chester, MD 2004

DOT Hazardous Materials Emergency Response Guide Book 2004 Edition-US DOT Hazardous Materials Transportation Bureau 20509