Rogers Fire Department Standard Operating Procedures

Policy Title:	Natural Gas Emergencies		
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PURPOSE

The accidental release of natural gas is a common incident. Often mechanical damage to regulators, meters, and piping will precipitate the release of the gas. This policy is established for use in such incidents to ensure appropriate and safe incident mitigation.

POLICY

Natural Gas Chemistry

The primary component of natural gas is methane. Methane has a vapor density of .55 and will rise through air. There are no toxic components or health hazards associated with natural gas. However, in concentrations, it will displace oxygen and cause drowsiness and potential suffocation. An odorant called Ethyl mercaptan is added to natural gas to give it a pungent odor. Without this odorant, natural gas is odorless. The flammable range for natural gas is from 5% to 15%. This means that any mixture in air of less than 5% or greater than 15% will not ignite.

Signs of Natural Gas Leaks

The most common reasons for natural gas leaks are accidental damage caused by excavation, construction, farming activities, or careless driving. While many times it is easy to spot a natural gas leak, sometimes it is not so obvious. Do not rely on the odor alone to determine the presence of a leak. In underground leaks where natural gas is passed through the soil, the odor may be eliminated. The following conditions along a pipeline easement could indicate a natural gas leak:

- A hissing or roaring sound
- Unusual odor
- Dead or discolored vegetation
- Fire coming from the ground or burning above the ground
- Dirt being blown or thrown into the air

- Water bubbling or being blown into the air at a pond, creek, or river
- A dry spot in a moist field

Initial Response

Companies should position themselves upwind of the hazard area and evaluate water supply options in case of fire or explosion. Full structural firefighting clothing with SCBA is mandatory for all personnel working in the warm or hot zones of natural gas emergencies. Complacency on these types of calls is strictly discouraged.

Establishing a hot zone and evacuating the immediate area should be a high priority for the first-arriving company. The initial isolation distance is 330 feet for all civilians. Companies shall stage apparatus and personnel at least 100 feet away from the leak. Anything within this area should be evacuated, including occupied buildings.

Sources of potential ignition should be eliminated. This includes open flames, electrical switches, gas-fueled machinery and engines. As soon as the incident commander suspects a natural gas leak, the gas company should be notified. Always ensure the gas company has been contacted as soon as a leak is identified.

Intervention – Outside Leaks

The initial response for natural gas emergencies <u>occurring outside of a structure</u> shall be the closest fire company and Rescue 2. If Rescue 2 is not available, the closest company equipped with a four-gas monitor will be sent in its place. The following responsibilities are assigned to each company on a natural gas leak/odor investigation outside of a structure:

> <u>First-Due Fire Company</u> - conduct initial investigation, prepare for fire suppression (if necessary), and identify control zones
>
> <u>Rescue Company</u> – conduct air monitoring and initiate tactics to isolate, plug, or shut off the leaking natural gas.

Fire department personnel shall intervene to stop natural gas leaks when a threat to life or property exists. If a standard shut off is not available, no gas is entering any structure, the surrounding area is void of any exposures, and the gas is dissipating into the atmosphere, a <u>non-intervention strategy</u> is encouraged.

If an offensive strategy is implemented to control and stop leaking gas, members shall adhere to policies regarding proper PPE, respiratory protection, and hazardous materials leak intervention. During the implementation of offensive strategies, the following safety precautions must be taken:

- The fire company must identify a water supply source and position their apparatus accordingly in case it becomes necessary to use it.

- A charged 1.75” hoseline must be stretched and staffed.
- Adequate reconnaissance of the leak must be conducted to determine whether it can be stopped or plugged.
- Air monitoring of the control zone boundaries shall occur to determine the presence of a flammable atmosphere and manage control zones.

Shifting air currents can cause rapid changes in the concentration of natural gas. If the decision is made to monitor the leak and allow the gas company to intervene, it remains the responsibility of the incident commander to make sure gas company personnel in the hot zone wear protective equipment that is commensurate with the risk. Under no circumstance will members allow gas company personnel to create an unsafe situation.

If companies are able to successfully plug and stop a leak, they can return to service as long as they’re confident in the stability of the plug and they have notified the gas company of the situation. At least one company should remain on scene of plugged leaks in high-risk areas until the arrival of the gas company.

Intervention – Leaks Inside a Structure

When natural gas leaks are reported inside a commercial, industrial, high-rise, or multi-family structure, a full hazardous materials assignment consisting of two engines, two ladders, Rescue 2, one medic, and the battalion chief will be dispatched. For single-family residential dwellings, only a single engine and the rescue company will be dispatched, although the incident commander may special call for additional resources.

Natural gas leaks inside structures will be mitigated using monitors to determine the affected areas and the appropriate control zones. Any building with a natural gas odor or confirmed leak should be evacuated. Based on the risk and fence-line monitoring, it may be prudent to evacuate adjacent structures as well. All ignition sources should be quickly and completely eliminated inside evacuated structures. Whenever possible, electrical service should be shut down from the outside of the building. Consideration must also be given to eliminate auxiliary generators from becoming active when electrical service is shut down. Upper stories, attics and cocklofts need to be monitored due to the vapor density of natural gas.

Exposures, whether attached or unattached, shall be monitored to determine the extent of the leak. All sources of ignition shall be controlled, if odor or metered concentration is detected. Ventilation should be initiated early to prevent natural gas from accumulating above the lower explosive limit (LEL). Firefighters should be aware that sometimes gas may have to be ventilated from above the upper explosive limit (UEL) through the explosive range. Firefighters must be careful and non-complacent during the ventilation effort. Natural ventilation is the preferred method to remove natural gas.

Turning off gas service in any structure requires the identification of the regulator or meter. The regulator takes street pressure of up to 40 psi and "steps" it down to 0.5 or 0.25 psi prior to being metered. When turning the gas off at the meter, crews should operate the shut-off valve prior to the meter. The valve is always a quarter-turn in the piping prior to the regulator. Normally, this is the pipe coming from the ground. Before closing the valve, note the sound of gas flowing through the meter and look for movement of the numbers of the face of the meter. After the valve has been shut off, the sound and movement should cease.

Fire companies will not shut-off gas in curb boxes, street boxes, or manholes. Only gas company personnel should operate these valves. Operating valves located in these locations may actually increase pressure to customer service and exacerbate the incident.

Note that Ethyl mercaptan is heavier than air. If a building is unoccupied for an extended amount of time, and natural gas has been leaking for an extended period of time, the Ethyl mercaptan and natural gas may separate, causing an odor in lower floors with little to no presence of natural gas, and an area of natural gas with no odor in upper floors.

Natural Gas Fires

The tactics and positioning employed for an outside gas leak can also be used for a natural gas-fed fire outside. The IC shall always ensure at least two fire companies are assigned to fires of this variety, thereby increasing the initial response. Apparatus and hose lines should be placed with consideration to the responding gas company vehicle. At a minimum, a 1.75" line along with a dry powder extinguisher shall be deployed. The goal of any suppression effort should be to protect exposures, not necessarily to extinguish the fire.

The best way to control an outdoor natural gas fire is to shut off the flow of natural gas upstream of the incident.

Natural Gas Incident Summary

Natural Gas Leak Outside, No Fire

Description:

- Minimal danger to life, property, and the environment
- Leak typically for mechanical damage to a meter or pipe

Incident Actions:

- Evacuate immediate area
- Notify gas company
- Evaluate hazards including exposures, environment, vehicular traffic, etc
- Conduct fence line monitoring to determine control zones

- Remove ignition sources from the area
- Consider non-intervention strategy
- If offensive tactics selected, ensure proper PPE, respiratory protection, thermal protection, and tactics are utilized

Response Level:
- One fire company and Rescue 2

Natural Gas Leak Outside with Fire

Description:
- Moderate danger to life, property, and the environment
- Leak typically caused from mechanical damage with nearby operating equipment (car, backhoe, etc) causing a fire

Incident Actions:
- Evacuate immediate area
- Notify gas company
- Protect hazards from fire damage
- Do not extinguish the fire unless directed to do so by the gas company
- Consider water supply options

Response Level:
- Two fire companies and Rescue 2

Natural Gas Leak Inside a Structure

Description:
- Significant danger to life, property, and the environment
- Leak is typically difficult to identify and locate

Incident Actions:
- Evacuate building and nearby structures
- Notify gas company
- Position apparatus away from the structure
- Attempt to control gas where it enters the building
- Ventilate the building (using intrinsically-safe methods)
- Remove ignition sources from inside by shutting off power on the outside of the structure

Response Level:

- Two engine companies, two ladder companies, Rescue 2, one medic, and the battalion chief

Sample ICS Organizational Chart for a natural gas leak inside a structure (E2 E3 L1 L5 R2 Medic 1 BC1):