Natural Gas Response

Purpose

This policy is based on natural gas pipeline emergencies with the product already in its gaseous/vapor form. This policy does not address liquefied or compressed natural gas emergencies.

Natural gas is a naturally occurring hydrocarbon gas mixture consisting primarily of methane. Natural gas is a fossil fuel used as a source of energy for heating, cooking, and electricity generation

These types of incidents will be approached with the utmost caution and ALL natural gas pipeline SOG/SOPs MUST be followed to prevent death, significant injury, and Fire Department liability.

Natural Gas - Fire Diamond

- Health – 2
- Flammability – 4
- Instability – 0
- Special - none

Natural Gas Physical Properties

- Colorless, tasteless, odorless gas (unless an odor causing agent has been added)
- Natural gas is predominantly methane
- Natural gas is a Class 2 Flammable gas
- Ignition Temperature - 1163º F
- Flash point - minus 180 Celsius
- Molecular weight 16.04 (air is 28.97)

- Natural gas is much lighter than air and will dissipate rapidly outside
- Inside of buildings and any other contained vessels, natural gastends to pocket, particularly in attics, under stairs, and in dead air spaces
- The flammable limits are 5 percent to 15 percent in air (remember that your meter is reading the percentage of the lower explosive limit not the actual percentage of the product in air)
- Odorized natural gas can be smelled at concentrations of less than 1%
- Any meter reading showing a LEL will require immediate evacuation of the building or area with the reading

Natural gas physical and health effect on humans

Natural gas is non-toxic and considered a simple asphyxiate. Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations.

Natural gas greatest threat to public/responders

- Explosions

Natural gas typically originates in underground deposits and is extracted in a number of ways. Energy companies have developed alternative processing methods to create natural gas. Transmission pipelines transport the natural gas at pressures of up to 1,500 psi throughout the country to local natural gas distributors.

Local, gas distribution systems operate at pressures ranging from 99 to 0.25 psi (0.25 psi is the usual pressure downstream of a residential gas meter) and consist of mains, services, valves and meters that are constructed of steel, cast iron, ductile iron, wrought iron or plastic, depending on the system age and type of service. Natural gas transmission and distribution piping system installations must conform to rigid construction requirements set forth in ANSI B31.8, Gas Transmission and Distribution Piping System Standard.

Natural Gas Pipeline Response Levels

1. Natural gas reported OUTSIDE of a building with no explosion
    - 1 Engine
    - 1 Battalion Chief
2. Ruptured, cut, broken, or leaking high pressure natural gas lines with no explosion
    - 2 Engines
    - 1 Ladder/ Tower
    - 1 Ambulance
    - 1 Battalion Chief
3. Natural gas reported inside of any building or structure (or space – i.e. sewer, etc.) with no explosion
    - 2 Engines
    - 1 Ladder/ Tower
    - 1 Ambulance
    - 1 Battalion Chief
4. Any known gas explosion
    - Full 1st Alarm structural response
    - Appropriate HAZMAT response based on the caller info (with a minimum response of 1 HAZMAT Unit (with at least 2 Techs))

HAZMAT Qualifications to control

- FF 1 & 2 with HAZMAT Operations Level credential
- Understanding of Gas Monitoring and its limitations
- Trained in process of metering to include where to meter
- Understanding of the properties of Natural Gas (lighter than air)

PPE and required equipment

- All members working in the warm zone of the incident will wear full structural FF PPE, SCBA on, with the members face piece available to rapidly don
- 4 gas meter with the following sensors – O2, LEL, H2S, CO. The meter must be "zeroed out" in fresh air before using in the hazard zone.
- FD personnel in the warm zone will be limited to the absolute minimum required to size up the incident

Responding to Natural Gas Incidents

Natural Gas may be encountered in a variety of situations and incident types, each presenting a different set of hazards and problems. Again, natural gas explosions represent a major cause of FF LODDs and serious injury on HAZMAT incidents. These types of incidents must be approached with the utmost caution.

If the level and type of release is known while responding, first due units will use their ERG to determine safe apparatus placement locations and staging areas (a minimum of 333 ft.).

ERG information

- The material name is listed as “Natural gas, compressed” in the Blue pages
- Directs the user to Guide #115
- Chemical ID number: 1971

Natural gas pipeline emergencies fall into 3 separate, distinct categories:

A. Natural gas leaks with no visible ignition
B. Natural gas leaks with ignition (free burning)
C. Natural gas leaks that have exploded

Reported gas Leak - NO visible ignition

Use the ERG as a basic guide for natural gas leaks. When responding to a reported gas leak with no fire or explosion, the first arriving unit should:

- Spot their apparatus at least two houses away or 333 feet from the dispatched address, upwind whenever possible
- All later arriving units shall maintain Level-2 staging a minimum of 800 feet away from the address/area of the leak, upwind whenever possible
- Only a minimum number of personnel shall be allowed to size-up the situation
- All personnel must be in full PPE and crew must be equipped with a 4-gas monitor (preferably 2 monitors) capable of detecting natural gas
- Personnel are metering for the percentage of LEL and the possible displacement of Oxygen in confined areas and dead spaces within

and around the structure

- In the cold zone, start monitoring the environment when approaching the leak area
- Personnel in the warm zone must be in full PPE with SCBA on with their face piece ready to don

When metering for natural gas, any positive LEL readings indicate that natural gas is present. Units shall:

- Immediately go from the Offensive strategy (investigation mode) to the Defensive strategy
- Ensure the local natural gas provider is responding
- Evacuate any civilian and firefighting personnel from the structure a minimum of at least 2 houses away or 333 ft.
- Upon evacuation, if easily accessible, isolate and shut-off the gas meter to the occupancy (typically opposite side of house from garage)
- Single family home; evacuate at least the 2 homes around all sides of the house (or 333 ft.)
- Multi family, mixed use, and commercial occupancies; the entire building should be evacuated initially with consideration for additional evacuation of the exposures depending on their distance and arrangement around the source (using the 333 ft. guideline)
- Await the local utility company for control/mitigation

Ruptured gas lines that are exposed to open air:

- Immediately assume the Defensive strategy
- Ensure the local natural gas provider is responding
- Evacuate any civilian and firefighting personnel from the structure a minimum of at least 333 ft away

- Natural gas providers are the AHJ for natural gas incidents. They have all the necessary personnel and equipment to mitigate these types of events. FD personnel at no time should try to mitigate/ control the leak
- Fire department members will remain outside of the hot zone and will only provide warm and cold zone support to the natural gas provider
- Fire department shall not provide “protection lines” for natural gas workers. The greatest threat of natural gas is an explosion. A hand line will not put out an explosion and only exposes more people to the threat

Underground, migrating natural gas leaks

Natural gas explosions have occurred in structures which were not served by natural gas. Underground leaks may permit gas to travel considerable distances before entering a structure through:

- The foundation
- Around pipes
- Storm drains and sumps
- Other void spaces

Once an underground leak has been identified:

- Ensure the local natural gas provider is responding
- Evacuation distances for these types of incidents could be much further than the standard 333 ft.
- While evacuating, continue to meter the exterior of structures to determine the overall scope of the incident (size of the hot zone)

- Do not rely on gas odor, the odorant in the gas may be scrubbed out by passage through the ground
- Continued metering will be performed by the natural gas provider to determine the proper evacuation distances and what control measures will be taken to stabilize

Natural Gas – No Ignition - General Guidelines

The greatest risk of natural gas is an explosion which can be ignited by a spark or open flame. Sparks can come from turning electrical equipment on and off. If possible, radios, pagers, cell phones, etc. should be turned off before approaching the area. Fire fighters should avoid using doorbells or any other electrical equipment. Prohibit smoking and prevent other potential sources of ignition.

Flipping electrical breakers off could have the potential to cause a spark, causing an explosion if a concentration of gas were present. The local electrical provider must be requested if the power to the structure needs to be secured to reduce the explosion hazard. **FD members must NOT secure the electric utilities in these situations, have the power company do it.**

Anytime a gas meter is secured (turned off) the local natural gas provider must be notified, dispatched to the scene, and command transferred over to them.

If fire department personnel shut off/isolate any type of natural gas equipment located upstream of an occupancy's gas meter, THEY MUST LEAVE THAT EQUIPMENT OFF and notify the local natural gas provider. The local gas company is the ONLY agency that can turn on ANY natural gas piping or equipment.

If the problem is an extinguished pilot light on an appliance, Fire Department personnel shall attempt to close the shut-off to that appliance. Fire Department personnel shall not re-light pilot lights even if they are assured there is not an explosive accumulation in the area. If the gas leak cannot be stopped by an in-line shut-off, then the gas supply to the building shall be shut off and red tagged until repairs are completed.

Natural gas leaks with ignition (free burning)

Burning natural gas should not be extinguished, since this changes the hazard from being visible to invisible and creates a high explosion hazard. By nature, these are all Defensive incidents until the natural gas provider can verify there is no more explosion hazard present. Natural gas fires should be controlled by:

- Evacuate any occupants to minimum safe distances
- Protect exposures
- Continue to monitor the area for any natural gas reading/ concentrations to define the hot zone
- Await the local utility company for final control/mitigation

This is a very short IAP for something that is on fire. It is not in a firefighter’s nature to let something "burn". But when something is on fire that is fueled by natural gas, we have to use the above IAP until the fuel source can be secured. Once secured and the natural gas provider has verified there is no more explosion hazard present, the incident becomes a standard structural fire deployment.

An explosion has occurred

Units arriving at the scene of a structure explosion must consider natural gas as a significant possible cause. In these circumstances, the cause of the explosion may be difficult to determine. 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 personnel in the area to an absolute minimum. The area (blast zone) hosting the explosion shall be considered Defensive. No member shall enter this area until the proper gas and electric companies have deemed the area is safe from hosting any further gas explosions. A standard IAP for a natural gas explosion:

- Notify the gas and electric companies and request an immediate response
- The number of exposed personnel shall be kept to an absolute minimum. All apparatus must spot at least two houses away or 333 ft. away from the explosion area, in the cold zone. A SAFETY PERIMETER SHALL BE ESTABLISHED AND MAINTAINED AROUND ANY SUSPECTED GAS LEAK, FIRE, OR EXPLOSION
- Conduct a recon and search for possible victims outside of the explosion zone. Interview neighbors or witnesses to try to determine if the building(s) was occupied. Victims can be found a long distance from the origin of the explosion
- Observe for signs of gas leaks, i.e., flames coming through cracks in the ground or around foundations, or bubbling through puddles
- Do not extinguish flames coming up through the ground
- Check systematically using combustible gas meters, following the “Reported gas Leak - NO visible ignition” metering guidelines

- Any metering readings of LEL - all personnel must be evacuated a minimum of 333 ft from the last zero reading on the meter
- Evacuate all exposed structures. Do not enter the structure after it has been evacuated. The natural gas provider will meter the interior all the exposures during their size-up
- Always beware of the possibility of additional explosions
- Shut off the gas in other exposed buildings if easily accessible and it's safe to do so (you're out of the hot zone)

Because something has just exploded, other structures located in close proximity could be involved in fire. Most of the nearby structures will have also suffered structural damage. If a structure in the defensive blast area is involved in fire, operations will be conducted only in the warm zone to protect exposures. No entry shall be made in the hot zone for any firefighting activity.

Reported gas in sewers, drainage systems, and below grade vaults

Various types of gas from a variety of sources can be found in sewers, drainage systems, and below grade vaults. This includes natural gas, propane, gasoline, sewage gas, hydrogen sulfide (very lethal), and CO from electrical cable burnout.

If on fire, do not attempt to extinguish any flames if a gas becomes ignited in a sewer or underground vault. This will be a defensive incident. Establish a hot zone around the opening and keep vehicles and bystanders away from nearby manhole covers. Prohibit smoking and eliminate other potential sources of ignition.

Any type of flammable gas in a sewer system can travel long distances from its source. When gas has been confirmed in a sewer, these types of events generally require a much larger evacuation area and large HAZMAT organizations.

These types of incidents create very high hazards for both the public and responders. Only a Type 3 HAZMAT Team and above can make entry in a confined space that is suspected of containing hazardous materials of any kind. The Operations level shall only meter above grade and follow the policies outlined in this training module.

Decon

Decon is not required for natural gas only issues.

Organization used for natural gas incidents

Most natural gas incidents are handled by the first responding unit and the local utility company and these incidents don't require large command organizations.

Arrangements will need to be made for both agencies (FD and Utility company) to meet at a designated command post, in the cold zone, to perform a face to face on what both agencies need to do to support each other.

Law enforcement may be necessary to coordinate intermediate and large-scale evacuations when they are required.

Natural gas incidents have the potential of exposing large numbers of people that may require the IC to expand the command structure to include EMS and/or a hazmat branches.