



12-2025 HAZMAT Tactical Guideline – Natural Gas Pipeline Response

This SOP is based on natural gas pipeline emergencies already in their gaseous/vapor form. This SOP does not address liquefied or compressed natural gas emergencies.

Natural gas pipeline emergencies represent one of the most common HAZMAT emergencies that local fire departments respond to. The Pipeline and Hazardous Materials Safety Administration (PHMSA) reports that, over the past ten (10) years, on average, there have been almost 300 incidents a year involving natural gas explosions or significant fires. These incidents seriously injure 65 people, kill 13, and cause 475 million dollars in property damage per year.

Natural gas explosions also represent one of the leading causes of FF LODDs and serious injury on HAZMAT incidents.

These types of incidents will be approached with the utmost caution, and ALL natural gas pipeline SOPs MUST be followed to prevent:

- Death
- Significant injury
- 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 predominately methane
- Natural gas is a Class 2 Flammable gas
- Ignition Temperature - 1163° F
- Flash point - minus180 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 gas tends 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%

Whenever there is a gas leak - somewhere there is the right mixture to support an explosion and/or fire

Natural gas physical and health effect on humans

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

Natural gas is the greatest threat to the public/responders

Explosions

General Natural Gas Distribution info

Natural gas typically originates in underground deposits and is extracted in a number of ways. Energy companies have also 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 outlined in ANSI B31.8, Gas Transmission and Distribution Piping System Standard.

The U.S. Department of Transportation (DOT) maintains jurisdiction over the safety of transmission pipelines. Distribution systems must comply with DOT regulations and any public utility commission requirements.

Utility companies must ensure the integrity of their natural gas distribution systems through a comprehensive safety program that involves surveying, monitoring, maintenance, and testing. Most utility companies are responsible for the entire local distribution system, including the natural gas meter. Property owners are responsible for all natural gas piping inside buildings downstream of the meter.

Many rural and suburban areas don't have piped natural gas service. In these areas, the gas service may be bottled gas, such as liquid propane gas (LPG). The information contained in this specific SOP doesn't apply to LPG. Fire departments should be aware of where natural gas service is available in their local coverage areas.

Incident call-taking guidelines

Alarm/Dispatch will try to obtain the following information when processing a natural gas pipeline emergency:

- Verify natural gas pipeline emergency
- Release/leak occurring inside a structure or in the open
- Location of the leak if known
- Has an explosion or fire occurred
- Number of people exposed or injured

Alarm/Dispatch will:

- Instruct anyone exposed to evacuate to safe areas (100 meters away from the structure)
- **Request for response of the natural gas pipeline service provider on ALL natural gas emergencies**

Natural Gas Pipeline Response Levels

1. Natural gas reported OUTSIDE of a building with no explosion/fire
 - 1 Engine
 - 1 District Chief
2. Ruptured, cut, broken, or leaking high-pressure natural gas lines with no explosion/fire
 - 2 Engines
 - 1 Ladder
 - 1 Medic
 - 1 District Chief
3. Natural gas inside of any building or structure (or space – i.e., sewer, etc.) with no explosion or a gas fire that is NOT exposing a structure
 - 2 Engines
 - 1 Ladder
 - 1 Medic
 - 1 District Chief
4. Any known gas explosion or gas fire exposing a structure
 - 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 Quals to control

- FF 1 & 2 with HAZMAT Operations Level credential
- Understanding of Gas Monitoring and its limitations
- Trained in the process of metering to include where to meter
- Understanding of the properties of Natural Gas (lighter than air)
- Natural Gas response does not require any specialized training, PPE, or equipment outside what most Fire Departments have available

PPE and allied equipment required

- All members working in the warm zone of the incident will wear full structural FF PPE, SCBA on, with the member's 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 it 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

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. – 100 meters).

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

GUIDE 115 GASES - FLAMMABLE (INCLUDING REFRIGERATED LIQUIDS)	
POTENTIAL HAZARDS	
FIRE OR EXPLOSION	
<ul style="list-style-type: none">• EXTREMELY FLAMMABLE.• Will be easily ignited by heat, sparks or flames.• Will form explosive mixtures with air.• Vapors from liquefied gas are initially heavier than air and spread along ground.	
CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)	
<ul style="list-style-type: none">• Vapors may travel to source of ignition and flash back.• Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.• Containers may explode when heated.• Ruptured cylinders may rocket.	
HEALTH	
<ul style="list-style-type: none">• Vapors may cause dizziness or asphyxiation without warning.• Some may be irritating if inhaled at high concentrations.• Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.• Fire may produce irritating and/or toxic gases.	
PUBLIC SAFETY	
<ul style="list-style-type: none">• CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.• As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.• Keep unauthorized personnel away.• Stay upwind, uphill and/or upstream.• Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).	
PROTECTIVE CLOTHING	
<ul style="list-style-type: none">• Wear positive pressure self-contained breathing apparatus (SCBA).• Structural firefighters' protective clothing will only provide limited protection.• Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.	
EVACUATION	
Large Spill	
<ul style="list-style-type: none">• Consider initial downwind evacuation for at least 800 meters (1/2 mile).	
Fire	
<ul style="list-style-type: none">• If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.• In fires involving Liquefied Petroleum Gases (LPG) (UN1075); Butane, (UN1011); Butylene, (UN1012); Isobutylene, (UN1055); Propylene, (UN1077); Isobutane, (UN1969); and Propane, (UN1978), also refer to BLEVE – SAFETY PRECAUTIONS (Page 368)	
 In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping document and/or the ERAP Program Section (page 391).	

GUIDE 115 GASES - FLAMMABLE (INCLUDING REFRIGERATED LIQUIDS)	
EMERGENCY RESPONSE	
FIRE	
<ul style="list-style-type: none">• DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.CAUTION: Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.	
Small Fire	
<ul style="list-style-type: none">• Dry chemical or CO₂	
Large Fire	
<ul style="list-style-type: none">• Water spray or fog.• Move containers from fire area if you can do it without risk.	
Fire involving Tanks	
<ul style="list-style-type: none">• Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.• Cool containers with flooding quantities of water until well after fire is out.• Do not direct water at source of leak or safety devices; icing may occur.• Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.• ALWAYS stay away from tanks engulfed in fire.• For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.	
SPILL OR LEAK	
<ul style="list-style-type: none">• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).• All equipment used when handling the product must be grounded.• Do not touch or walk through spilled material.• Stop leak if you can do it without risk.• If possible, turn leaking containers so that gas escapes rather than liquid.• Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.• Do not direct water at spill or source of leak.• Prevent spreading of vapors through sewers, ventilation systems and confined areas.• Isolate area until gas has dispersed.	
CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.	
FIRST AID	
<ul style="list-style-type: none">• Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.• Move victim to fresh air.• Call 911 or emergency medical service.• Give artificial respiration if victim is not breathing.• Administer oxygen if breathing is difficult.• Remove and isolate contaminated clothing and shoes.• Clothing frozen to the skin should be thawed before being removed.• In case of contact with liquefied gas, thaw frosted parts with lukewarm water.• In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.• Keep victim calm and warm.	

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

1. Natural gas leaks with no visible ignition
2. Natural gas leaks with ignition (free burning)
3. Natural gas leaks that have exploded

Natural gas control methods

Calls for "odor of gas," "gas leaks," "broken gas lines," and similar situations may range from minor to potentially disastrous incidents. Due to possible extreme consequences, these types of incidents must be approached with the utmost caution.

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:

- The first-arriving unit will stop at least 2 houses away, or 333 ft (100 meters), from the dispatched address, upwind whenever possible.
- All later-arriving units shall maintain Level-2 staging at least 800 feet 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 two monitors) capable of detecting NG LEL
- 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
- Shut off all vehicles (ignition sources) in the warm zone.
- Personnel in the warm zone must be in full PPE with SCBA on with their face piece ready to don (two out).

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

- Immediately go from the Offensive strategy (investigating) to the Defensive strategy
- Ensure the local NG provider is responding
- Evacuate any civilian and firefighting personnel from the structure a minimum of at least two houses away or 333 ft. – 100 meters from the last LEL reading.
- Upon evacuation, if easily accessible, isolate and shut off the gas meter to the occupancy.
- Single-family home; evacuate at least the two homes around all sides of the house (or 333 ft. – 100 meters)
- 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 100-meter evacuation guideline).
- The larger the occupancy, the larger the potential energy there is to release
- Await the local utility company for control/mitigation.

Ruptured gas lines that are exposed to the open air

- Immediately assume the Defensive strategy.
- Ensure the local NG provider is responding.
- Evacuate any civilian and firefighting personnel from the structure a minimum of at least 333 ft away – 100 meters.
- NG providers are the AHJ for NG 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 NG provider.
- The fire department shall not provide “protection lines” for NG workers. The greatest threat of NG is an explosion. A handline will not put out an explosion and only exposes more people to the threat.

Underground, migrating NG leaks

Natural gas explosions have occurred in structures that 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 NG provider is responding
- Evacuation distances for these types of incidents could be much further than the standard 333 ft. (100 meters)
- 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
- The NG provider will continue metering to determine the appropriate evacuation distances and the control measures to be taken to stabilize.

NG – No Ignition - General Guidelines

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

Flipping electrical breakers off could cause a spark, potentially leading to an explosion if a gas concentration 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 situation, have the power company do it.

Anytime a gas meter is secured (turned off), the local NG 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 occupancies gas meter, THEY MUST LEAVE THAT EQUIPMENT OFF and notify the local NG 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 relight pilot lights even if they are assured there is no 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. 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 readings/concentrations to define the hot zone
- Await the local utility company for final control/mitigation

NG 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 utility companies have deemed the area is safe from hosting any further gas explosions.

- 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 (100 meters) 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. – 100 meters from the last zero reading on the meter
- Evacuate all exposed structures. Do not enter the structure after it has been evacuated. The NG 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 pose significant hazards to 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 the procedure.

Decontamination (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 (LE) may be necessary to coordinate intermediate- and large-scale evacuations when required. When LE is needed for the incident, follow the evacuation SOP outlined in the HAZMAT command function section.

Natural gas incidents have the potential to expose large numbers of people, potentially requiring the IC to expand the command structure to include EMS and/or a hazmat branch.

Natural gas lessons from the past

NIOSH Investigation F2009-13. This incident involved eight firefighters from a combination department who were injured in a natural gas explosion at a strip mall located in Maryland.

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the injuries of eight firefighters:

- Insufficient execution of the fire department's updated standard operating guideline on incidents involving flammable gas, e.g., apparatus and fire fighters operating in a flammable area (hot zone)
- The accumulation of natural gas in the structures' void spaces
- An unmitigated ignition source
- Insufficient combustible gas monitoring equipment usage and training
- Ineffective ventilation techniques

NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should:

- Ensure that standard operating guidelines for natural gas leaks are understood and followed
- Contact utility companies (natural gas and electric) immediately to cut external supply/power to structures when gas leaks are suspected
- Ensure gas monitoring equipment is adequately maintained, and firefighters are routinely trained on proper use
- Ensure that collapse/explosion control zones are established when dealing with a potential explosion hazard