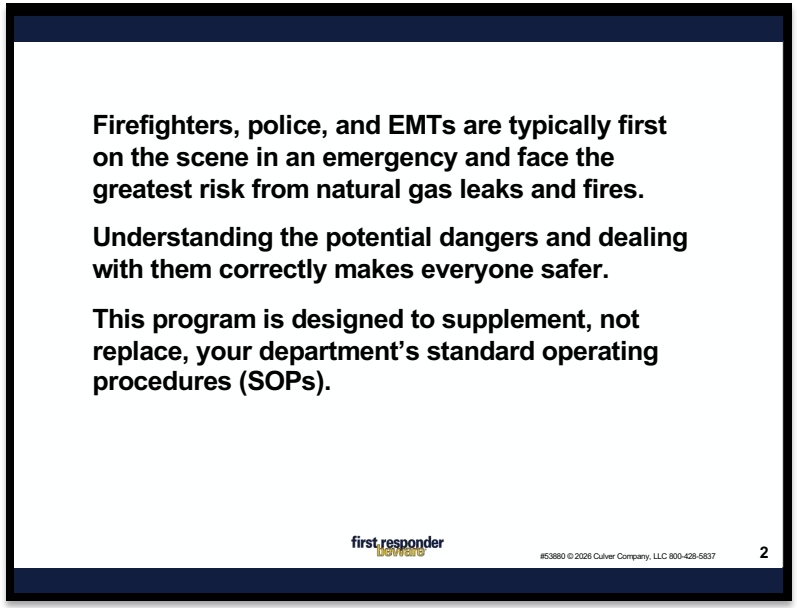
Before darkening the room, offer a welcome and an overview.

Begin by introducing the program:

Welcome to *First Responder Beware: Staying Safe While Protecting Others, Natural Gas Safety for First Responders*. Today's session will cover strategies for working safely around and handling certain emergencies involving natural gas.

By following the precautions we'll cover here today, you can keep yourself, your fellow first responders, and the public safe. Now I know that some of you will have heard this information before, and so for you, this program will be a refresher. For others, this may be the first time you're hearing about this topic, but I hope everyone will find the program valuable.

Darken the room and begin the presentation.



Firefighters, police, and EMTs are typically first on the scene in an emergency and face the greatest risk from natural gas leaks and fires.

Understanding the potential dangers and dealing with them correctly makes everyone safer.

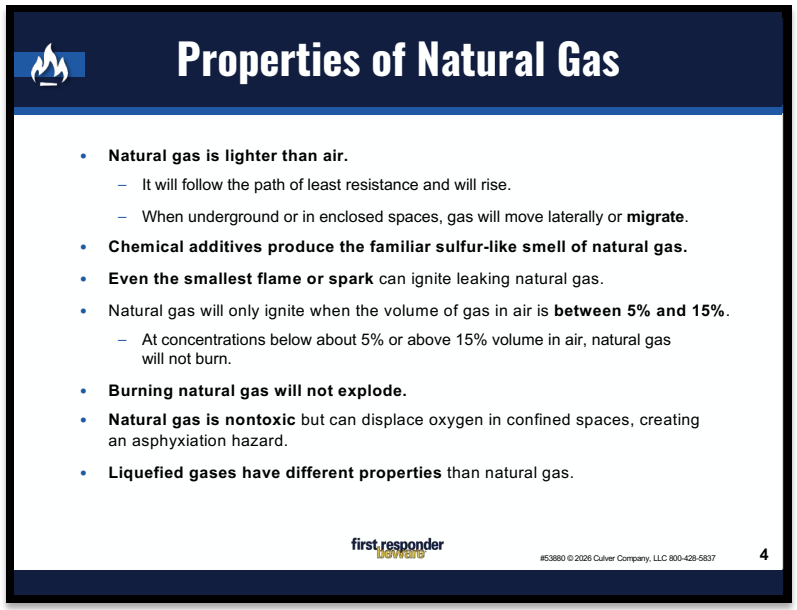
This program is designed to supplement, not replace, your department's standard operating procedures (SOPs).

This is a good time to reiterate the importance of this information: that it can protect first responders, incident victims, and bystanders from natural gas-related injury or death.

Please note that each local department will have its own SOPs about natural gas safety. Emphasize to participants that this program is not designed to replace those SOPs, only to supplement them.

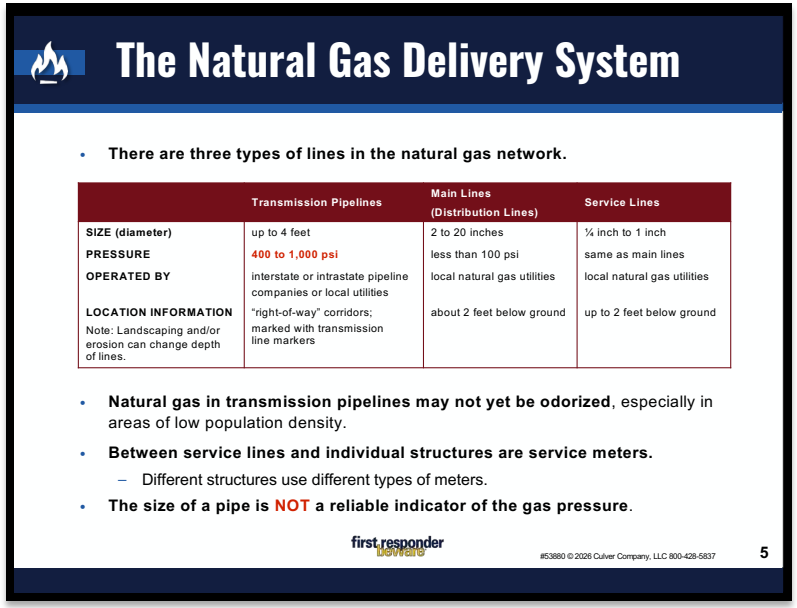
This presentation will cover key practices you need to know to keep yourself safe around natural gas lines and on the scene of emergencies involving natural gas. The topics we are going to focus on are:

- Properties of Natural Gas
- The Natural Gas Delivery System
- Pipeline Locations
- Preventing Natural Gas Ignition
- Responding to Natural Gas Emergencies
- Indoor Natural Gas Leaks
- Outdoor Natural Gas Leaks
- Natural Gas Fires



You will someday have to deal with natural gas at an incident scene. So it's important to know a few basic facts about natural gas, its properties, and how it behaves.

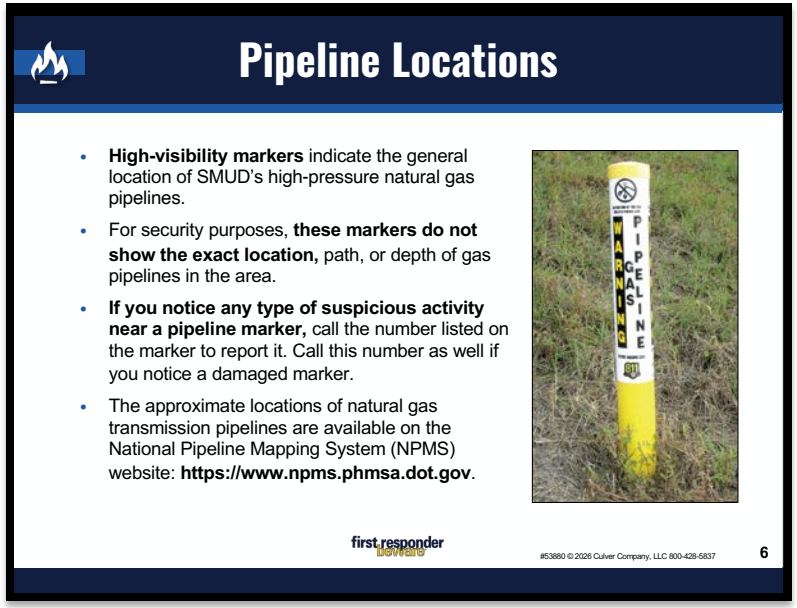
- Natural gas is lighter than air.
  - It will follow the path of least resistance and will rise. Be alert. Natural gas will travel upward through any available space: stairwells, ducts, or a crack in the road. It can even seep up through soft ground.
  - When underground or in enclosed spaces, gas will move laterally or migrate. It will travel as far as it can under roads and along utility lines and ceilings until it finds a way up.
- Chemical additives produce the familiar sulfur-like smell of natural gas. Natural gas has no smell of its own. Treated gas is referred to as "odorized." (Not all gas is odorized, and certain conditions may strip or reduce the smell, so don't rely on your nose alone to detect a leak.)
- Even the smallest flame or spark can ignite leaking natural gas.
- However, natural gas will only ignite when the volume of gas in air is between 5% and 15%. This is known as the explosive range or the flammable range. When the volume of gas in air is at least 5%, a gas meter that reads a percentage of lower explosive limit (or LEL) will indicate a 100% reading.
  - At concentrations below about 5% or above 15% volume in air, natural gas will not burn. While gas should always be treated as highly flammable, in fact, it will only burn within this limited concentration range.
- Burning natural gas will not explode.
- Natural gas is nontoxic. It contains nothing harmful or toxic that can be absorbed into the bloodstream. However, natural gas can displace oxygen in confined spaces, creating an asphyxiation hazard.
- Liquefied gases have different properties than natural gas. Emergencies involving propane and butane may require different precautions and tactics than those covered in this program. Refer to departmental SOPs for these liquid gases.



It's useful to know a bit about how gas is delivered to structures.

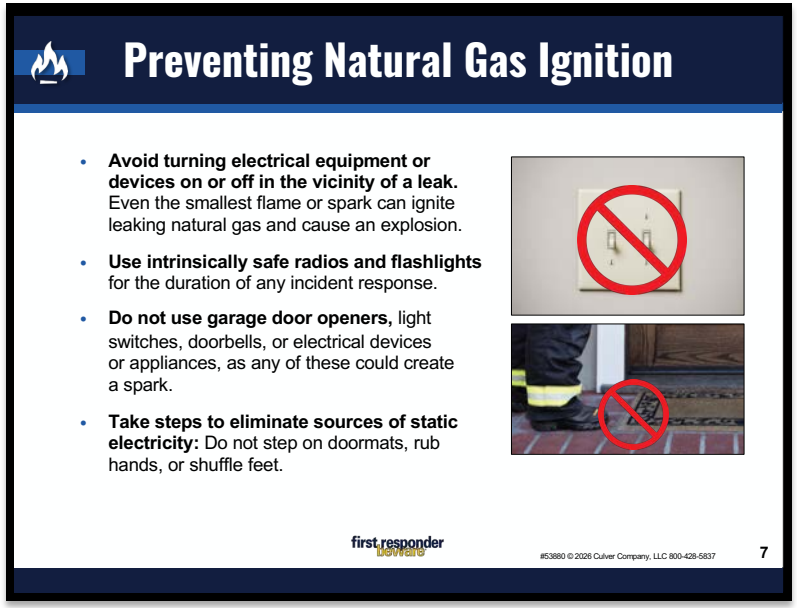
- There are three types of lines in the natural gas network: transmission pipelines, main (or distribution) lines, and service lines. These lines are used to transport natural gas. For each line type, this table shows the typical size, pressure, operator, and location information.
  - Transmission pipelines are the largest and have a pressure of 400 to as much as 1,000 pounds per square inch. These lines carry gas long distances from the refineries to localities where it will be used. Transmission pipeline markers will include a contact phone number.
- Natural gas in transmission pipelines may not yet be odorized, especially in low-density population areas. Leaks from these lines may not be detectable by smell alone. Be cautious.
- The next type of natural gas line is the main (also referred to as a distribution line). These are smaller lines with a pressure of less than 100 pounds per square inch. They are the property of SMUD. Call the utility for assistance with mains.
- Service lines run from mains to individual structures. They have the same pressure as the main line that feeds them, but they can still cause a significant leak. Call SMUD for assistance with these.
- Between service lines and individual structures are service meters.
  - Different types of structures use different types of meters.
- The size of a pipe is not a reliable indicator of the gas pressure.

This information is intended only as an overview. Always assume there's a danger.



Here is some information about the location of natural gas pipelines in your response area.

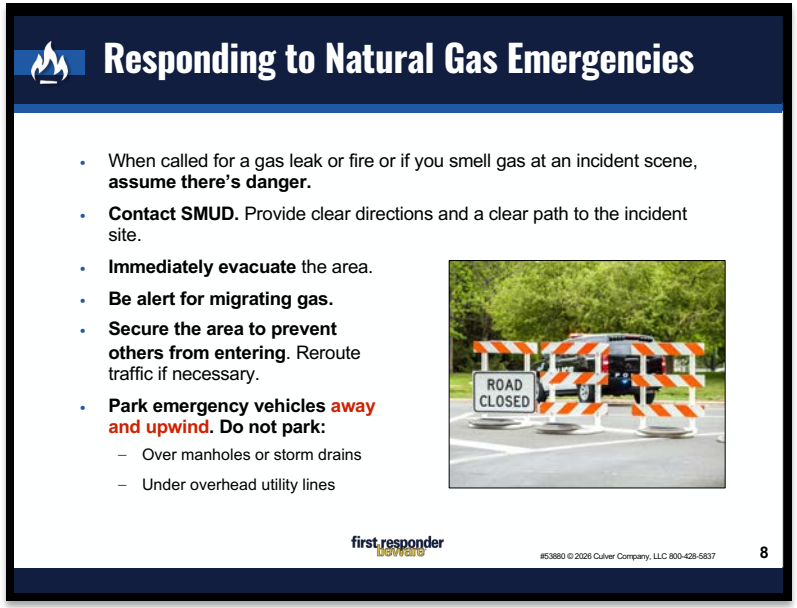
- High-visibility markers indicate the general location of SMUD's high-pressure natural gas pipelines. These markers are usually found where a pipeline crosses a street, highway, railway, or waterway.
- For security purposes, these markers do not show the exact location, path, or depth of gas pipelines in the area. In addition, pipelines may not follow a straight course between markers.
- If you notice any type of suspicious activity near a pipeline marker or if you see construction occurring near a marker with no utility personnel present, call the number listed on the marker to report it. Call this number as well if you notice a damaged marker or an emergency in the vicinity.
- The approximate locations of natural gas transmission pipelines are available on the National Pipeline Mapping System (NPMS) website: https://www.npms.phmsa.dot.gov.
- For the specific location of transmission pipelines that cross your area of jurisdiction, state and local officials (including all first responders) may apply at the NPMS website for access to the Pipeline Information Management Mapping Application (PIMMA) via the Office of Pipeline Safety.



Natural gas pipeline incidents are rare; however, their consequences can be severe. Natural gas that escapes from an underground pipeline can travel through soil or utility lines into nearby structures, where a spark or flame can ignite the gas and cause an explosion or fire.

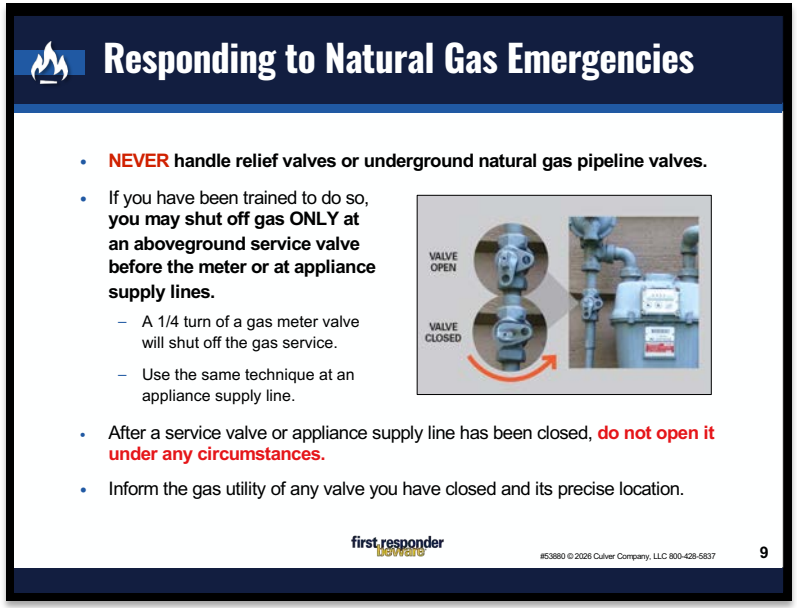
There are some simple tactics that can minimize the chances of an explosion. Some of these may seem far-fetched or overly cautious, but they aren't. Disregarding these precautions can lead to explosions.

- Avoid turning electrical equipment or devices on or off in the vicinity of a leak. Even the smallest flame or spark can ignite leaking natural gas and cause an explosion. Sparks can come from some unexpected sources, so be vigilant. As gas dissipates and concentrations fall, they may pass through the explosive range. If ignition sources have not been eliminated before ventilation, the gas could ignite.
- Use intrinsically safe radios and flashlights in the vicinity of a known or suspected natural gas leak.
- Do not use garage door openers, light switches, doorbells, or electrical devices or appliances, as any of these could create a spark. Prevent their use by others. Be alert for evacuees and bystanders who may try to turn off lights and/or use electrical equipment. (When evacuating the area, remember to knock on doors instead of ringing doorbells.)
- Take steps to eliminate sources of static electricity. Rubbing your hands together to keep warm or even shuffling your feet on a doormat or carpet can create enough of a spark to ignite natural gas. Don't do it!



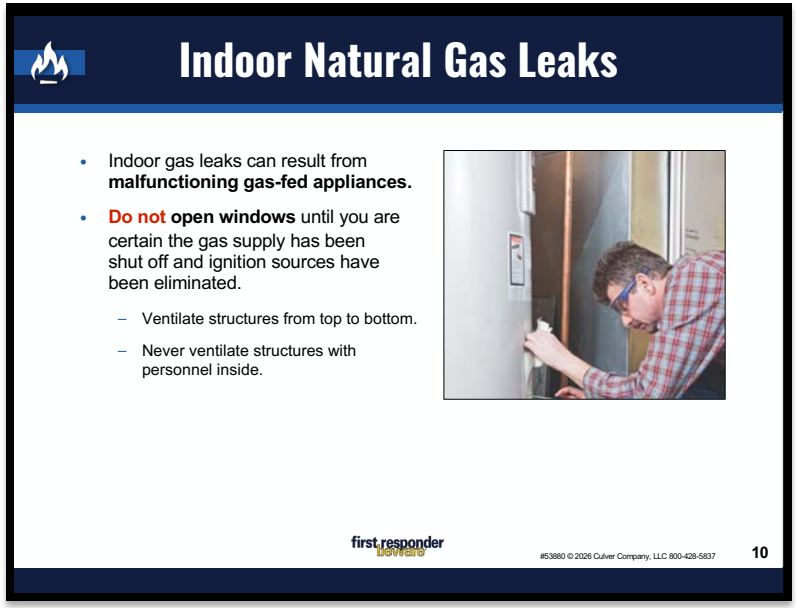
If you are first on the scene at a natural gas emergency, whether it's a gas leak or a fire, there are certain procedures you should follow.

- When called for a gas leak or fire or if you smell gas at an incident scene, assume there's danger.
- Contact SMUD immediately, whether you know that natural gas is present or just suspect it. If you are in law enforcement, confirm with dispatch that the local fire department has been notified.
  - Provide the best possible directions to the location. As simple as it sounds, giving utility personnel intersections, landmarks, and specific buildings will help get them onsite sooner.
  - While you wait for the utility vehicle to arrive, make sure there is a clear path to the incident site for utility personnel.
- Immediately evacuate the area 330 feet in all directions, if possible. For larger leaks, consider downwind evacuation for at least a half-mile. Be sure to knock on doors. Don't ring doorbells.
- Be alert for migrating gas and evacuate accordingly. Always consult your incident commander for specific instructions.
- Secure the area to prevent others from entering, and reroute traffic away from the incident as needed.
- Park emergency vehicles away and upwind from the area when natural gas may be present.
  - Do not park over manholes or storm drains. Natural gas can collect in these spaces and explode.
  - Do not park under overhead utility lines. A fire or explosion could bring the lines down on your vehicle.



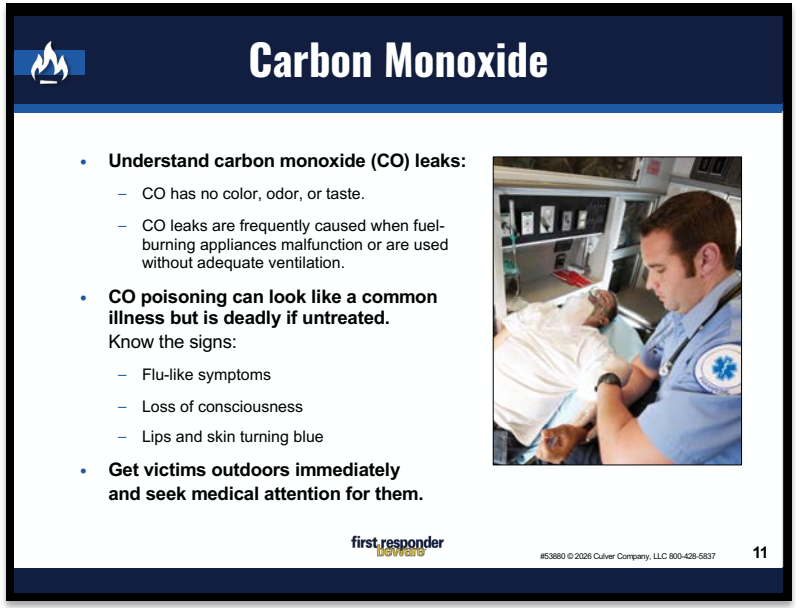
Knowing when and how to safely shut off natural gas service is key to preventing loss of life and property.

- Never handle relief valves or underground natural gas pipeline valves. Only utility personnel should operate these system valves.
- If you have been trained to do so, you may shut off gas at meters or appliance supply lines only. And do so only if you can access them safely.
  - A 1/4 turn of a gas meter valve will shut off the gas service. You can see a good example of this in the photos on this slide. These shutoffs may be hand-operated, or you may need a wrench. The meter valve is open when the valve lug is in line with (or parallel to) the gas pipe, and the valve is closed when the lug is crosswise (or perpendicular) to the pipe. Don't mistake other valves (such as grease valves) for the meter shutoff.
  - Use the same technique for shutting off gas service at an appliance supply line.
- After a service valve or appliance supply line has been closed, do not open it under any circumstances. Only utility personnel may restore gas service.
- Inform the gas utility of any valve you have closed and its precise location. This information is critical for system safety and service restoration.



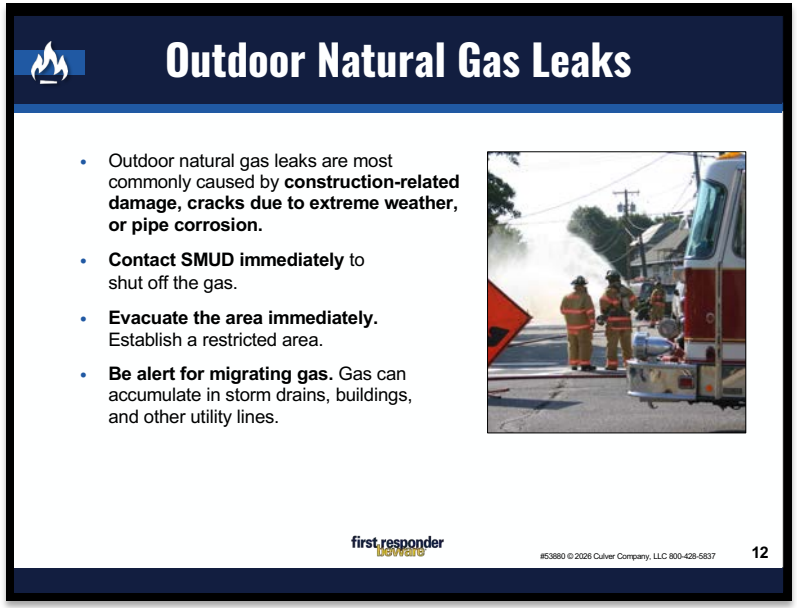
There are some additional response tactics for natural gas leaks that occur indoors.

- Indoor gas leaks can result from malfunctioning gas-fed appliances. If you can identify a specific appliance causing the leak, shut off the gas at the appliance's supply line. If you cannot identify a specific appliance or when in doubt, use the meter to shut off the gas. Be aware that what appears to be an indoor leak may be the result of gas migrating into the structure. Once service to the structure is off, verify that the leak has been eliminated.
- Do not open windows until you are certain the gas supply has been shut off. Remember that gas concentrations will change as gas dissipates. If ignition sources have not been eliminated, the gas could ignite as it passes through the explosive range, and if gas is still leaking into the space, concentrations can hover within the explosive range, causing prolonged danger.
  - Ventilate structures from top to bottom because natural gas is lighter than air and will rise.
  - Never ventilate structures while personnel are inside. This includes you. Open windows from outside only. Venting gas can ignite as it passes through the explosive range.



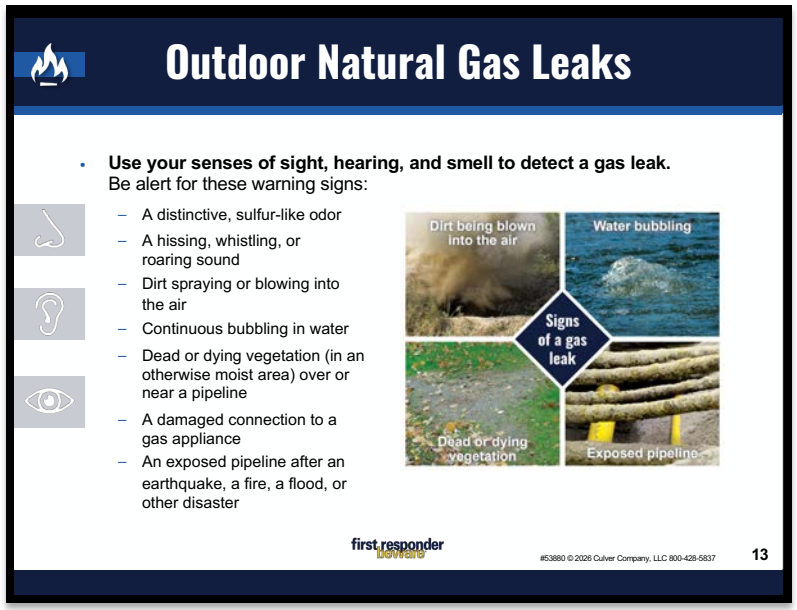
Carbon monoxide, or CO, is not a component of natural gas, but natural-gas-burning appliances can be a source of CO if they operate without adequate ventilation or if they malfunction or are used improperly.

- Understanding CO leaks can help you recognize possible CO poisoning victims.
  - CO has no color, odor, or taste, so its victims often don't know they are being exposed.
  - CO leaks are frequently caused when fuel-burning appliances malfunction or are used without adequate ventilation.
- CO poisoning can look like a common illness but is deadly if untreated. Learn to recognize the symptoms of CO poisoning and be alert for them in yourself, your fellow responders, and incident victims. The signs of CO poisoning include:
  - Flu-like symptoms
  - Loss of consciousness
  - Lips or skin turning blue
- Get victims outdoors immediately and seek medical attention for them. The treatment for CO poisoning is exposure to fresh air. In severe cases, pure oxygen is needed.



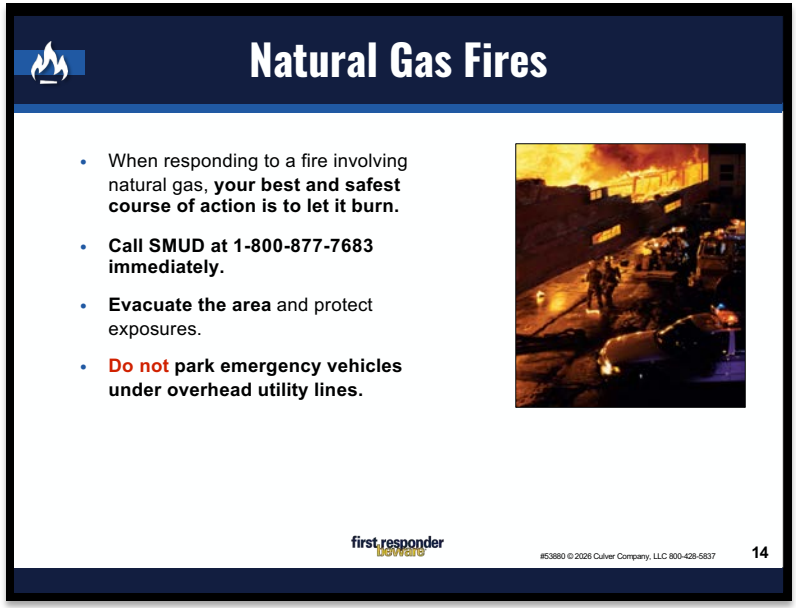
Gas leaks outdoors pose some different challenges than those indoors.

- Outdoor natural gas leaks can be caused by construction-related damage, cracks due to extreme weather, or pipe corrosion. Be on the lookout for evidence of construction activity and severe weather as indicators of a possible leak.
- Contact SMUD immediately to shut off the gas. Do this whenever you suspect a leak. They will respond, shut off the gas, and repair the damaged pipeline.
- Evacuate the area immediately and establish a restricted area.
- Be alert for migrating gas. Gas can accumulate in storm drains, buildings, and other utility lines, particularly as it moves laterally and seeks a path upward. As gas migrates, localized concentrations will change. Remember that natural gas can burn or explode as concentrations move through the flammable range.



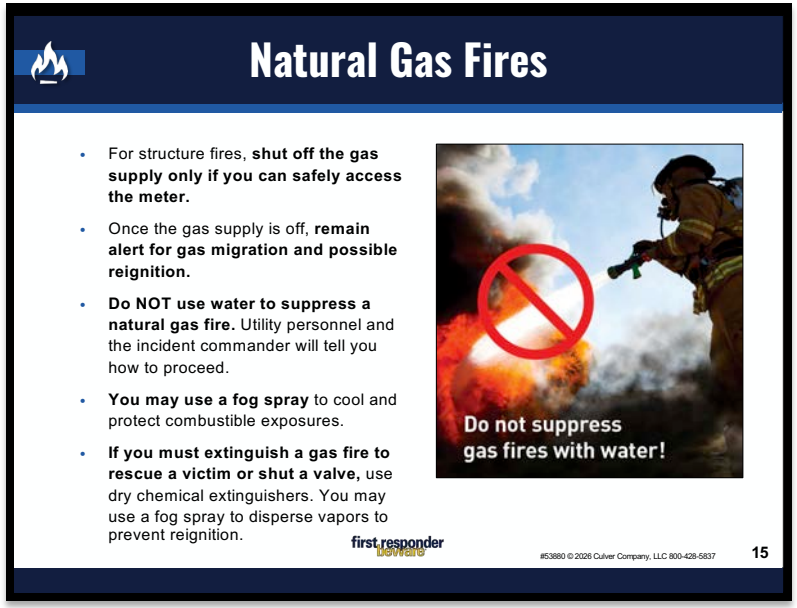
When on the scene of an outdoor emergency, always be alert for the telltale indicators of a natural gas leak. Depending on the pressure of the gas line, these indicators will vary. Be alert for any of the following signs:

- The distinctive, sulfur-like odor of natural gas. This odor comes from a chemical odorant called mercaptan. Be aware that some natural gas is not odorized, so some leaks may not be detectable by smell alone. Additionally, chemical or physical processes may strip the odorant from natural gas so that the gas no longer smells. This is known as "odor fade." Do not rely on smell alone to detect natural gas leaks.
- A hissing, whistling, or roaring sound. The sound could range anywhere from a low hissing sound to a loud roaring sound.
- Dirt spraying or blowing into the air. Depending on the pressure, the force of the moving dirt will vary.
- Continuous bubbling in water.
- Dead or dying vegetation (in an otherwise moist area) over or near a pipeline.
- A damaged connection to a gas appliance.
- An exposed pipeline after an earthquake, a fire, a flood, or other disaster.



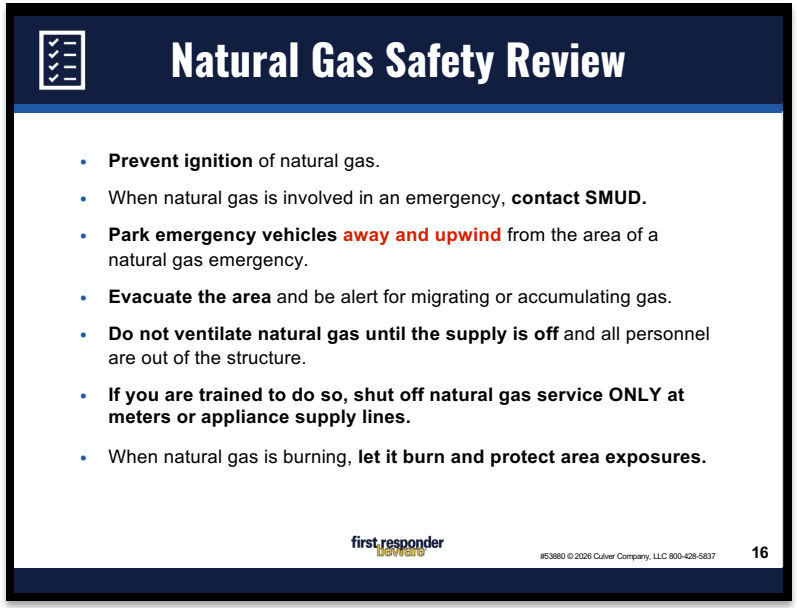
Burning natural gas poses special risks and requires extra precautions.

- When responding to a fire involving natural gas, your best and safest course of action is to let it burn. Remember that burning natural gas cannot explode. Your first priority, as always, is to protect life and property.
- Call SMUD at 1-800-877-7683 immediately. They will respond and determine when it's safe for you to proceed.
- Evacuate the area and nearby structures and protect exposures.
- Do not park emergency vehicles under overhead utility lines. Natural gas fires can burn overhead lines and cause them to fall. If that happens, follow your department SOPs for downed lines.



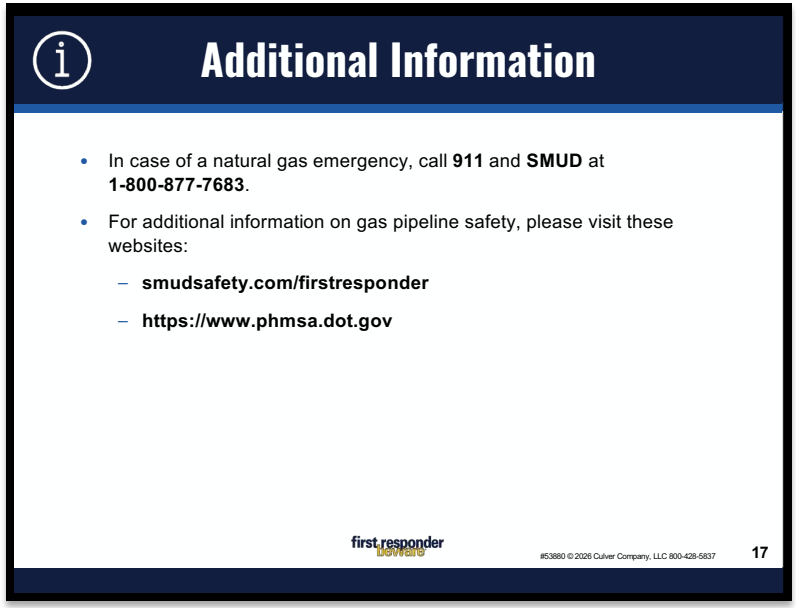
Letting a fire burn is most often the best option unless extinguishing the fire allows access for rescue. You must take special precautions when attempting to contain or suppress burning natural gas.

- For structure fires, shut off the gas supply only if you can safely access the gas meter. Be sure you have correctly identified the meter feeding the fire. Never attempt to shut off the gas at underground or main valves. If there is no meter, if it cannot be reached safely, or if you are unsure which meter is feeding the fire, wait for utility personnel to shut off the main supply. They will also help with monitoring concentrations once the flames are out.
- Once the gas supply is off, remain alert for gas migration and possible reignition. Keep all your protective gear on and the area secure until utility personnel and your incident commander give the all clear.
- DO NOT use water to suppress a natural gas fire. It is not effective and may introduce water into gas mains. Utility personnel and the incident commander will tell you how to proceed.
- You may use a fog spray to cool and protect combustible exposures.
- If you must extinguish a gas fire to rescue a victim or shut a valve, use dry chemical extinguishers. You may use a fog spray to disperse vapors to prevent reignition.



So let's review the key points of this presentation.

- Prevent ignition of natural gas. Do not use or allow others to use electrically powered devices, including doorbells and garage door openers, in the vicinity of a leak.
- When natural gas is involved in an emergency, contact SMUD. Be prepared for the utility vehicle to arrive and make sure there is a clear path to the incident site for utility personnel.
- Park emergency vehicles away and upwind from the area of a natural gas emergency.
- Evacuate the area and be alert for migrating or accumulating gas.
- Do not ventilate natural gas until the supply is off and all personnel are out of the structure. Open windows only from outside. Stay out of the structure if gas accumulates. Remember that gas can accumulate in storm drains as well as in structures.
- Shut off natural gas service at an aboveground valve by the meter or at an appliance supply line only. Never handle relief valves or underground pipeline valves.
- When natural gas is burning, let it burn and protect area exposures. Remember, water is not effective for extinguishing gas fires. Your incident commander and utility personnel will tell you how to proceed.



Here is some contact information that you may find useful.

- In case of a natural gas emergency, call 911 and SMUD at 1-800-877-7683.
- For additional information on gas pipeline safety, please visit the websites shown here.

Thank you for your attention.

Take questions and begin discussion.

Discuss how this information conflicts with what your audience believed about natural gas and how they may have put themselves or others at risk in the past. Ask participants what they would have done differently if they had known this information before.

The trainer's guide includes more detail about the properties of natural gas, safety procedures, a gas safety quiz, suggested discussion topics, and simulations for group use. Consider some of the suggested simulations or use your own.

SMUD thanks you for helping to keep first responders safe.