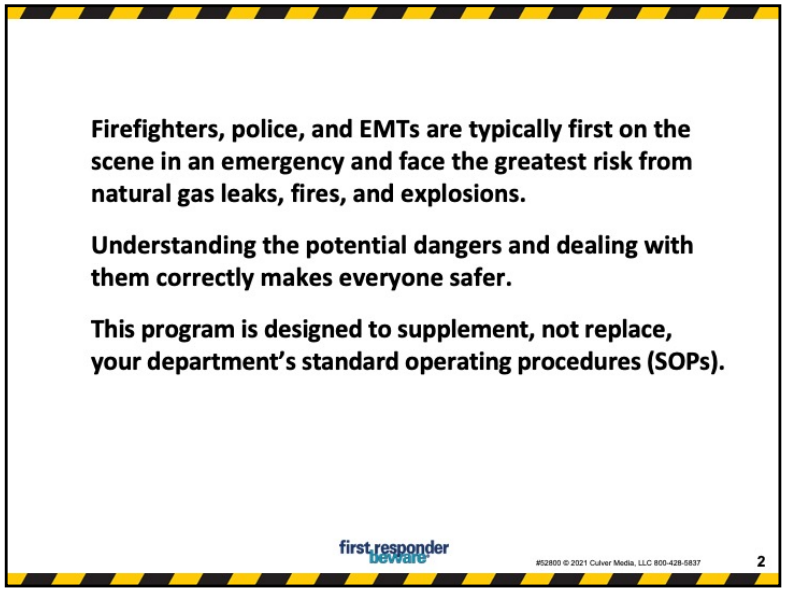
Before darkening the room, offer a welcome and an overview.

Begin by introducing the program and its topic:

- Welcome to *First Responder Beware: Staying Safe While Protecting Others, Natural Gas Safety for First Responders.* Today's session will share strategies for handling certain emergencies involving natural gas. By following the procedures 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.



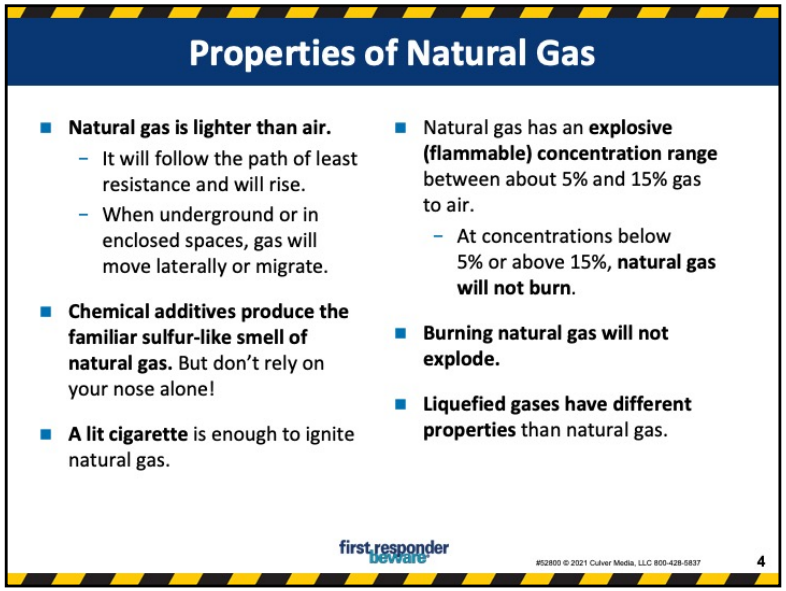
Firefighters, police, and EMTs are typically first on the scene in an emergency and face the greatest risk from natural gas leaks, fires, and explosions. Understanding the potential dangers and dealing with them correctly makes everyone safer. This program is designed to supplement, not replace, your 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: *Each local department will have its own standard operating procedures about natural gas safety. Emphasize to participants that this program is not designed to replace these procedures, only to supplement them.*

This presentation will cover key practices you need to know to keep yourself safe around natural gas lines and at 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
- Pipeline Reliability
- Hazard Prevention and Preparedness
- Preventing Natural Gas Ignition
- Responding to Natural Gas Emergencies
- Indoor Natural Gas Leaks
- Outdoor Natural Gas Leaks
- Natural Gas Fires
- Sources of Additional Information



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, 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, along utility lines and trenches, or along a ceiling 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." But don't rely on your nose alone! Treated gas can sometimes lose its odor, and not every line is treated.
- A lit cigarette is enough to ignite natural gas.
- Natural gas has an explosive or flammable concentration range between about 5 percent and 15 percent gas to air. A 10 percent gas-to-air mixture is ideal for clean burning.
  - At concentrations below 5 percent or above 15 percent, 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.
- Liquefied gases have different properties than natural gas. Emergencies involving propane and butane may require different precautions and procedures than those covered in this program. Refer to departmental SOPs for these liquid gases.

The Natural Gas Delivery System

- **There are three types of lines in the natural gas network: transmission, main, and service lines.**
- **Natural gas in transmission pipelines may not yet be odorized**, especially in low-density areas.

LINE TYPE	Transmission Pipelines	Main Lines (Distribution Lines)	Service Lines
SIZE (diameter)	up to 4 feet	2 to 20 inches	¼ inch to 1 inch
PRESSURE	**400 to 1000 psi**	less than 100 psi	same as main lines
OPERATED BY	interstate or intrastate pipeline companies or local utilities	local natural gas utilities	local natural gas utilities
LOCATION INFORMATION Note: Landscaping and/or erosion can change depth of lines.	right-of-way corridors; marked with transmission line markers (photo above)	about 2 feet below ground	up to 2 feet below ground

first responder beware

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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. These lines are used to transport natural gas.

Point to the second column in the table: Transmission Lines.

- 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. Pipeline markers like this . . .

Point to sample marker (photo).

- . . . will include a contact number. You can call CPS Energy for help with transmission lines if no contact information is available.
- Natural gas in transmission pipelines may not yet be odorized, especially in areas of low population density. Leaks from these lines may not be detectable by smell alone. Be cautious.

Point to the third column: Main Lines.

- The next type of natural gas lines are mains (also referred to as distribution lines). These are smaller lines with a pressure of less than 100 pounds per square inch. They are the property of CPS Energy. Call CPS Energy for assistance with mains.

Point to the fourth column: Service Lines.

- Service lines are the lines that 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 CPS Energy with these.

The Natural Gas Delivery System

- **Between service lines and individual structures are service meters.**
  - Different structures use different types of meters.
- **The size of a pipe is NOT a reliable indicator of the gas pressure.**

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- Between service lines and individual structures are service meters. This photo shows a standard, single-unit residential meter.
- 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.

Pipeline Locations

- **High-visibility markers** show the general route of high-pressure natural gas transmission pipelines and some distribution lines.
- For security purposes, **these markers do not show the exact location, path, depth, or number of gas pipelines in the area.** In addition, pipelines may not follow a straight course between markers.
- **These markers are usually found at road crossings, fence lines, and street intersections.**
- Visit the **National Pipeline Mapping System (NPMS)** website at https://www.npms.phmsa.dot.gov to learn the approximate locations of natural gas transmission pipelines in your area. State and local officials may also apply there for access to the Pipeline Information Management Mapping Application (PIMMA) to learn the specific location of the transmission pipelines that cross their jurisdiction.

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

- High-visibility markers like the one seen here show the general route of high-pressure natural gas transmission pipelines and some distribution lines.
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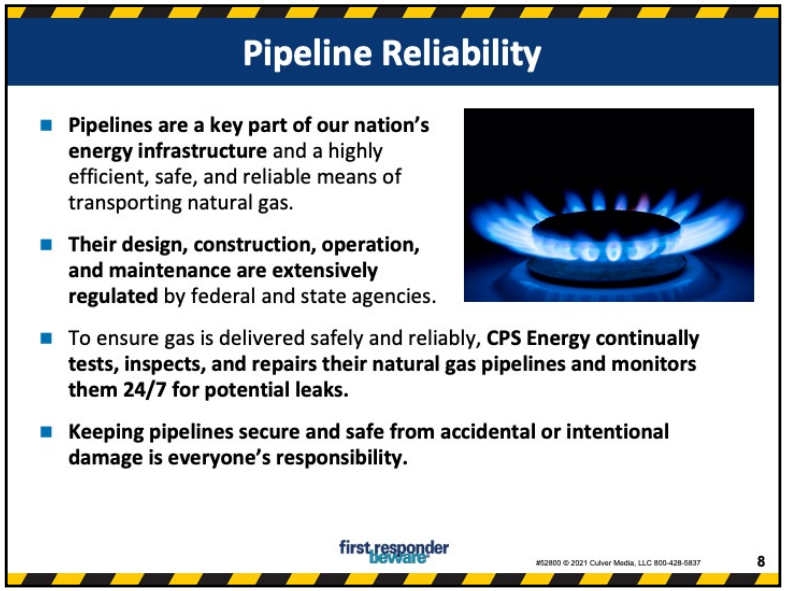
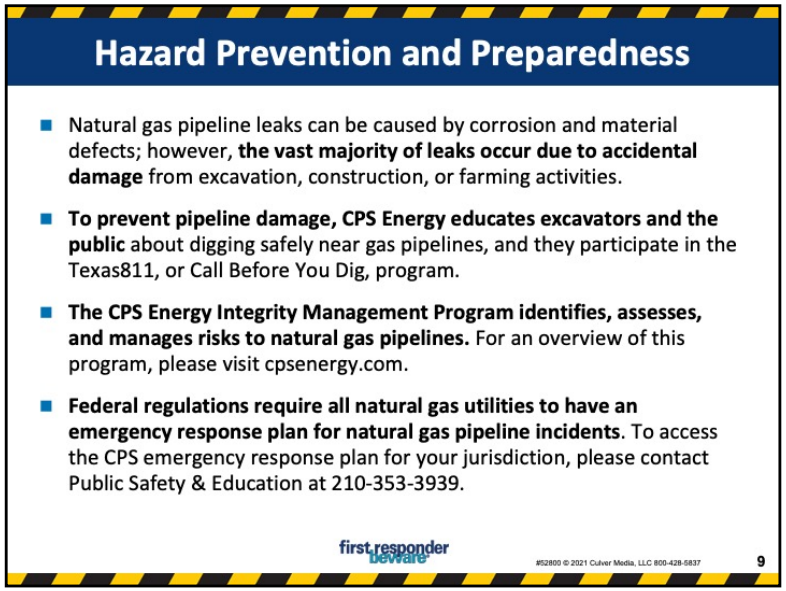


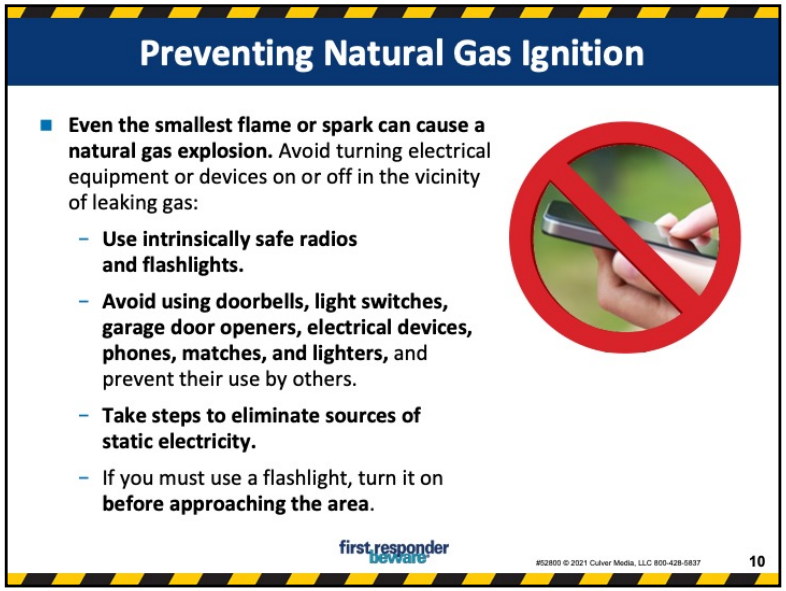
CPS Energy pipelines deliver natural gas to customers throughout greater San Antonio.

- Pipelines are a key part of our nation's energy infrastructure and a highly efficient, safe, and reliable means of transporting natural gas.
- Their design, construction, operation, and maintenance are extensively regulated by federal and state agencies.
- To ensure gas is delivered safely and reliably, CPS Energy continually tests, inspects, and repairs their natural gas pipelines and monitors them 24/7 for potential leaks.
- Keeping these pipelines secure and safe from accidental or intentional damage is everyone's responsibility.



CPS Energy undertakes several prevention measures to reduce the risks of natural gas leaks and their impacts.

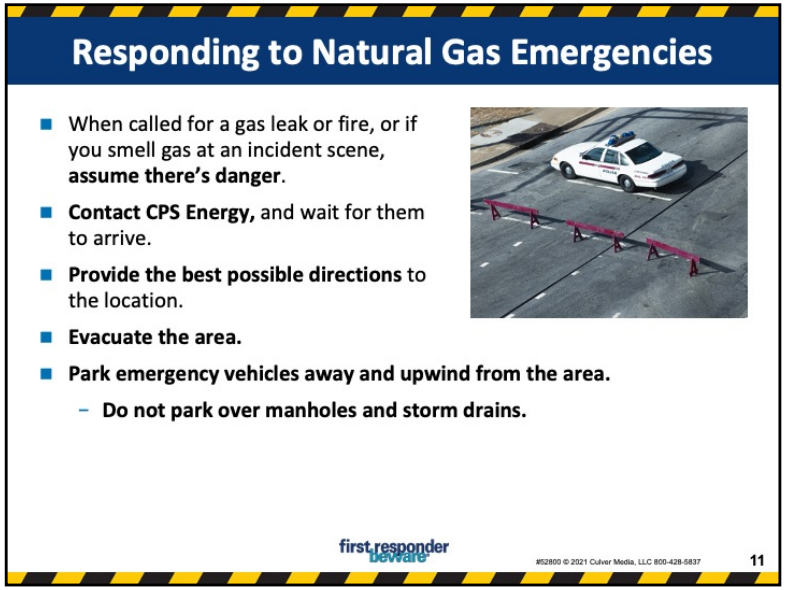
- Natural gas pipeline leaks can be caused by corrosion and material defects; however, the vast majority of leaks occur due to accidental damage from excavation, construction, or farming activities.
- To prevent pipeline damage, CPS Energy educates excavators and the public about digging safely near gas pipelines, and they participate in the Texas811, or Call Before You Dig, program.
- The CPS Energy Integrity Management Program identifies, assesses, and manages risks to natural gas pipelines. For an overview of this program, please visit cpsenergy.com.
- Federal regulations require all natural gas utilities to have an emergency response plan for natural gas pipeline incidents. To access the CPS emergency response plan for your jurisdiction, please contact Public Safety & Education at 210-353-3939.



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.

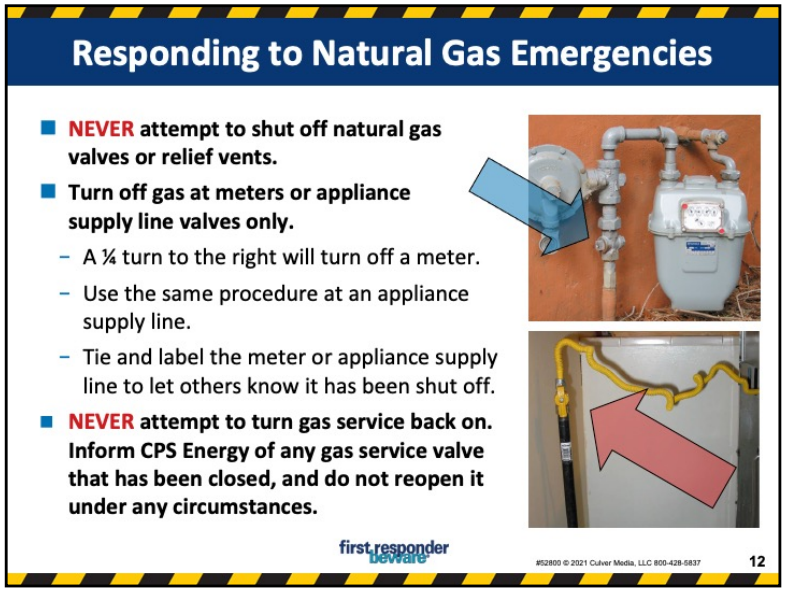
There are some simple procedures that can minimize the chances of an explosion. Some of these may seem far-fetched or overly cautious, but they aren't. Each of these mistakes has caused explosions at one time or another.

- Even the smallest flame or spark can cause a natural gas explosion. Avoid turning electrical equipment or devices on or off in the vicinity of leaking gas. 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.
    - Avoid using doorbells, light switches, garage door openers, electrical devices, phones, matches, and lighters, and prevent their use by others. Be alert for evacuees and bystanders who may try to turn off lights, make phone calls, or open garage doors. When evacuating the area, remember to knock on doors. Don't ring doorbells.
    - Take steps to eliminate sources of static electricity. Rubbing your hands together to keep warm or even shuffling your feet can create enough of a spark to ignite natural gas. Do not step on doormats; friction from your boots could also create a spark.
    - If you must use a flashlight, turn it on before approaching the area.



In addition to preventing ignition, there are certain procedures you should follow when responding to any natural gas emergency.

- When called for a gas leak or fire, or if you smell gas at an incident scene, assume there's a danger.
- Contact CPS Energy and wait for them to arrive. Call immediately whether you know that natural gas is present or just suspect it.
- 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 on site sooner.
- Evacuate the area, but be sure to knock on doors. Don't ring doorbells. In residential areas, one house in every direction is the recommended minimum radius. Be alert for migrating gas and evacuate accordingly. Always consult your incident commander for specific instructions.
- Park emergency vehicles away and upwind from the area when natural gas may be present.
    - Do not park over manholes and storm drains. Natural gas can collect in these spaces and explode.



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

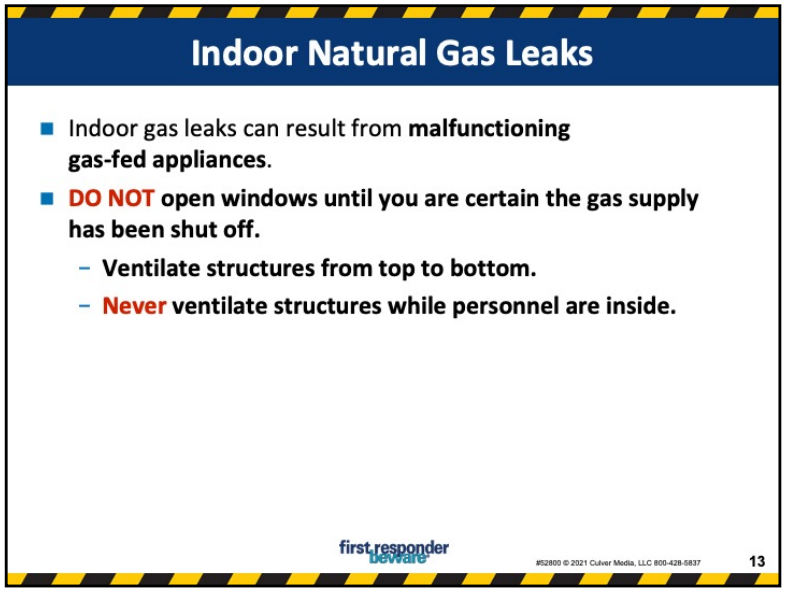
- Never attempt to shut off natural gas valves or relief vents. Only utility personnel should operate valves and relief vents.
- Turn off gas at meters or appliance supply line valves only. And do so only if you can access them safely.

Point to top photo of the gas meter.

- A ¼ turn to the right will turn off a meter. A gas meter valve is open when the valve lug is in line with the gas pipe, and the valve is closed when the lug is crosswise to the pipe. Don't mistake other valves (such as grease valves) for the meter shut-off.

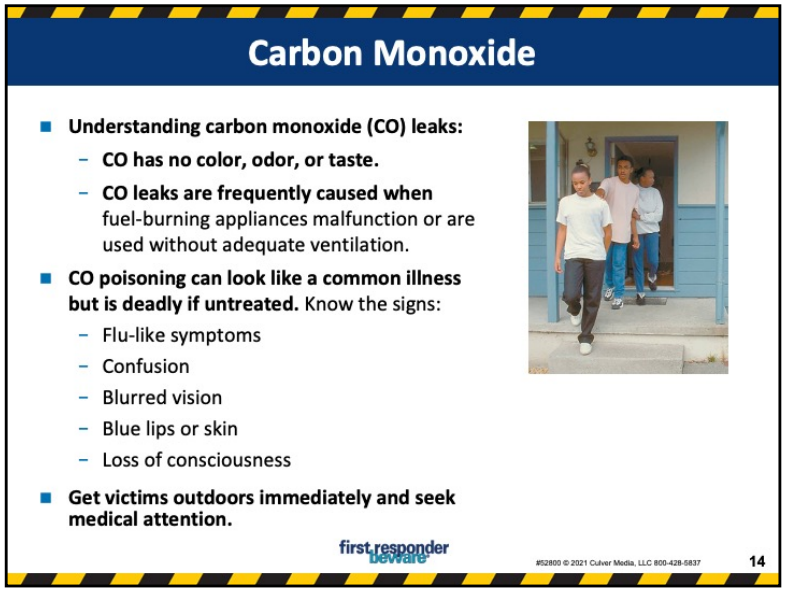
Point to the bottom photo of the appliance supply line.

- Use the same procedure for shutting off gas service at an appliance supply line.
- Tie and label the meter or appliance supply line to let others know it has been shut off.
- Never attempt to turn gas service back on. Only utility personnel may restore gas service. Inform CPS Energy of any gas service valve that has been closed, and do not reopen it under any circumstances.



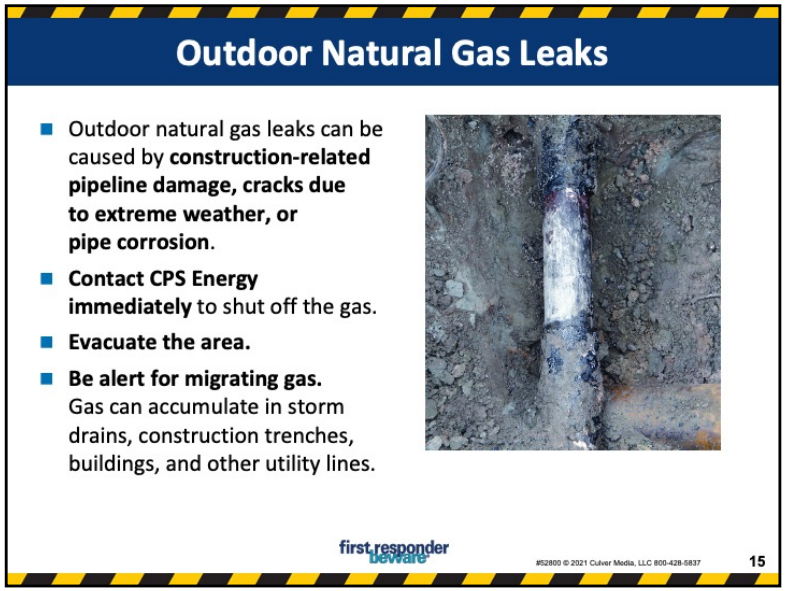
There are some additional procedures for natural gas leaks that occur indoors.

- 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.



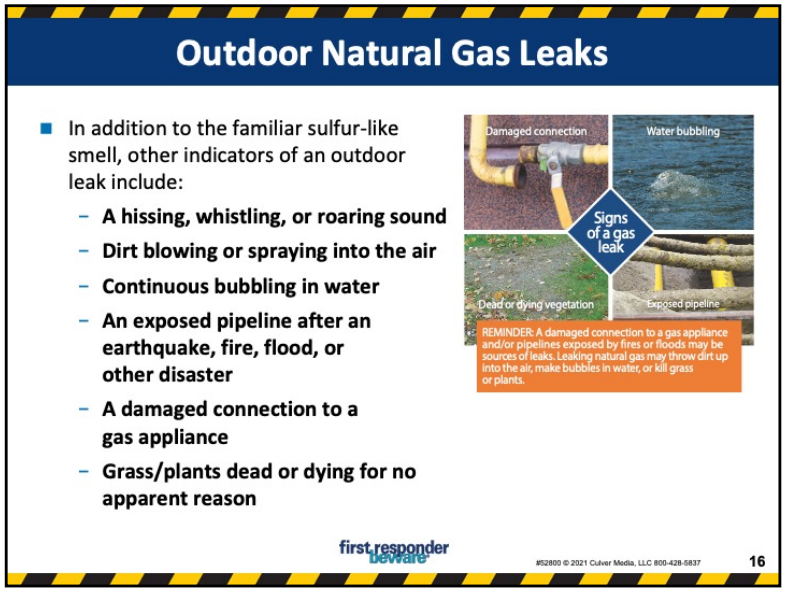
This deadly gas is not a component of natural gas, but natural gas-burning appliances can be a source of carbon monoxide if they operate without adequate ventilation, or if they malfunction or are used improperly.

- Understanding carbon monoxide (CO) leaks can help you recognize possible CO poisoning victims.
    - Carbon monoxide is a deadly gas that 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. CO poisoning can be particularly dangerous for people who are sleeping or intoxicated. People may suffer irreversible brain damage or even die before anyone realizes there's a problem. 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, such as weakness, shortness of breath, dull headache, dizziness, nausea, or vomiting
    - Confusion
    - Blurred vision
    - Blue lips or skin
    - Loss of consciousness
- Get victims outdoors immediately and seek medical attention. 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.

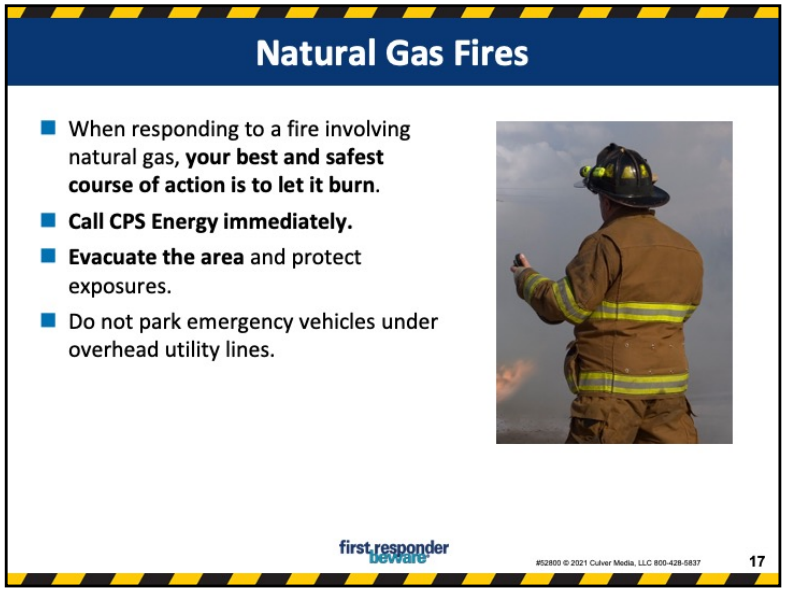
- Outdoor natural gas leaks can be caused by construction-related damage to pipelines, cracks due to extreme weather, or pipe corrosion. Be on the lookout for evidence of construction activity and severe weather as indicators of a possible leak.
- Contact CPS Energy immediately to shut off the gas. Do this whenever you suspect a leak. They will respond, turn off the gas, and repair the damaged pipeline.
- Evacuate the area.
- Be alert for migrating gas. Gas can accumulate in storm drains, construction trenches, 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.

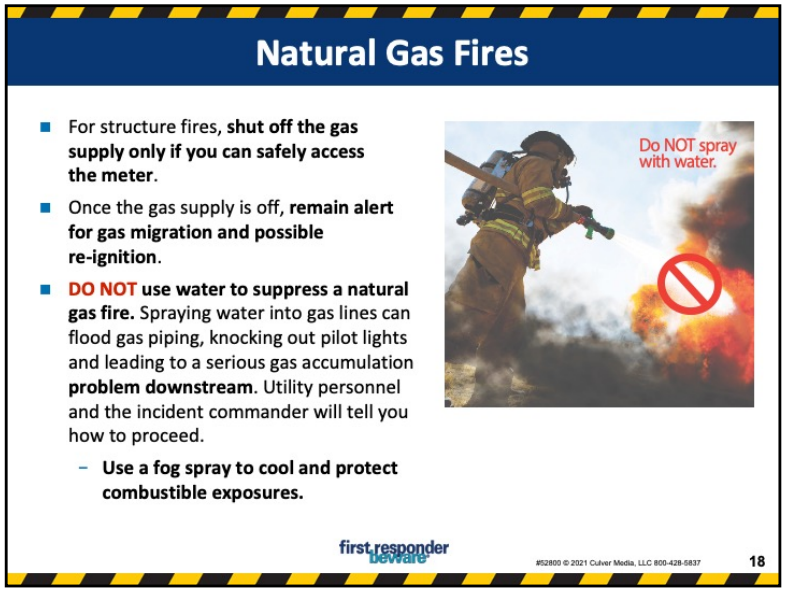
- In addition to the familiar sulfur-like smell, other indicators of an outdoor leak include:
  - A hissing, whistling, or roaring sound. The sound could range anywhere from a low hissing sound to a loud roaring sound.
  - Dirt blowing or spraying into the air. Depending on the pressure, the force of the moving dirt will vary.
  - Continuous bubbling in water.
  - An exposed pipeline after an earthquake, fire, flood, or other disaster.
  - A damaged connection to a gas appliance.
  - Grass or plants dead or dying for no apparent reason in an otherwise moist area over or near a pipeline.

Remember that not all natural gas is odorized, and conditions such as weather can make even odorized gas difficult to smell. Do not rely on smell alone to detect natural gas leaks.



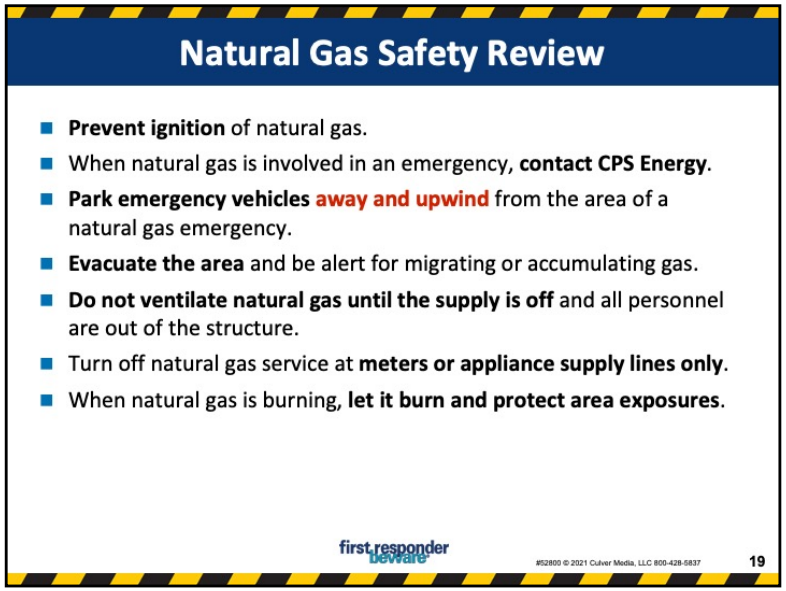
Burning natural gas poses special risks and requires extra precautions.

- 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 CPS Energy immediately. They will respond and determine when it's safe for you to proceed.
- Evacuate the area 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, you have another set of problems and must follow your department SOPs for downed lines.



Special procedures should be observed 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 re-ignition. 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, as it is ineffective. Spraying water into gas lines can flood gas piping, knocking out pilot lights and leading to a serious gas accumulation **problem downstream**. Utility personnel and the incident commander will tell you how to proceed.
    - Use a fog spray to cool and protect combustible exposures.



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

- Prevent ignition of natural gas. Even a small spark can ignite natural gas. Do not use or allow others to use electrically powered devices, including doorbells and radios, in the vicinity of a leak.
- When natural gas is involved in an emergency, contact CPS Energy.
- 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 and construction trenches as well as in structures.
- Turn off natural gas service at meters or appliance supply lines only. Never handle underground valves or release vents.
- 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.

Sources of Additional Information

- For electrical or natural gas emergencies, call 911 and CPS Energy at **210-353-HELP (4357)**.
- For additional information on gas pipeline safety, please visit these websites:
  - cpsenergy.e-smartresponders.com
  - cpsenergy.com/safety
  - rrc.state.tx.us
  - phmsa.dot.gov

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For electrical or natural gas emergencies, call 911 and CPS Energy at 210-353-HELP (4357).

For additional information on gas pipeline safety, please visit the websites shown here.

CPS Energy is available upon request to assist with drills and exercises to prevent and prepare for natural gas emergencies. Please contact Public Safety & Education at 210-353-3939.

Thank you for your attention.

Take questions and begin discussion.

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

The trainer's guide includes more detail about the properties of natural gas and how the gas delivery system works, as well as exercises and simulations. Consider some of the suggested simulations or use your own.

CPS Energy thanks you for helping to keep first responders safe.