




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 working safely around and 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.



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).

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- 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: Each local department will have its own standard operating procedures or SOPs about natural gas safety. Emphasize to participants that this program is not designed to replace these procedures, only to supplement them.

A presentation slide titled "Natural Gas Safety Basics" with a yellow and black striped border. The slide contains a bulleted list of topics and a footer with the "first responder beware" logo, a copyright notice, and a slide number.

Natural Gas Safety Basics

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

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This presentation will cover the 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
- Preventing Natural Gas Ignition
- Responding to Natural Gas Emergencies
- Indoor Natural Gas Leaks
- Outdoor Natural Gas Leaks
- Natural Gas Fires

Properties of Natural Gas

- **Natural Gas is lighter than air.**
 - It will follow the path of least resistance and will rise.
 - When underground or in enclosed spaces, gas will move laterally or migrate upward.
- **Chemical additives produce the familiar sulfur-like smell of natural gas.**
- **A lit cigarette or a spark from a light switch is enough to ignite leaking natural gas.**
- **Natural gas has an explosive (flammable) concentration range between about 5% and 15% gas to air.**
 - At concentrations below 5% or above 15%, natural gas will not burn.
- **Burning natural gas will not explode.**
- **Liquefied gases have different properties than natural gas.**


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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 upward. 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.”
- A lit cigarette or a spark from a light switch is enough to ignite leaking natural gas.
- Natural gas has an explosive or flammable concentration range between about 5% and 15% gas to air. A 10% gas-to-air mixture is ideal for clean burning.
 - At concentrations below 5% or above 15%, 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.
- Natural gas in transmission pipelines may not yet be odorized, especially in areas of low population density.
- 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.



Single-unit residential meter

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	"right-of-way" corridors; marked with transmission line markers	about 2 feet below ground	up to 2 feet below ground

Note: Landscaping and/or erosion can change depth of lines.

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It's useful to know a bit about the 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. Transmission pipelines are the largest and have a pressure of 400 to as much as 1000 pounds per square inch. These lines carry gas long distances from the refineries to localities where it will be used.
- 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.
- 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 NW Natural. Call NW Natural for assistance with mains.
- 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 NW Natural for assistance with these.
- Between service lines and individual structures are service meters. This is 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 Markers



- **High-visibility markers** indicate the general location of NW Natural's natural gas transmission and some distribution pipelines.
- For security purposes, **these markers do not show the exact location**, path, or depth of gas pipelines in the area.
- **If you notice any type of suspicious activity near a pipeline marker**, call the number listed on the marker to report it. Call this number as well if you notice a damaged marker.
- The approximate locations of natural gas transmission pipelines are available on the National Pipeline Mapping System (NPMS) website: <https://www.npms.phmsa.dot.gov>.

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Now we'll learn about pipeline markers like the one you see here.

- High-visibility markers indicate the general location of NW Natural's natural gas transmission and some distribution pipelines. These markers are usually found at road crossings, fence lines, and street intersections.
- 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.
- For the approximate locations of natural gas transmission pipelines in your area, visit 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 may apply for access to the Pipeline Information Management Mapping Application (PIMMA) via the Office of Pipeline Safety, also at <https://www.npms.phmsa.dot.gov>.

Preventing Natural Gas Ignition

- 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 a leak:
 - Use intrinsically safe radios and flashlights.
 - Do not ring doorbells, use garage door openers, or turn on or off any lights or electrical devices or appliances; prevent their use by others.
 - Take steps to eliminate sources of static electricity.
 - Do not step on doormats, rub hands, or shuffle feet.
 - Use combustible gas indicators to monitor the atmosphere, if it is safe to do so.



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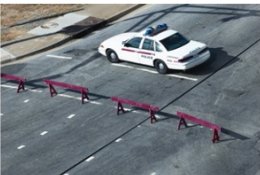
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The single greatest risk from natural gas leaks is explosion. There are some simple procedures that can reduce ignition hazards and minimize the chances of an explosion. Some of these may seem far-fetched or overly cautious, but they aren't. Each of 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 a leak. 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 ring doorbells, use garage door openers, or turn on or off any lights or electrical devices or appliances; prevent their use by others. Be alert for evacuees and bystanders who may try to turn off lights or make phone calls. 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 shoes or boots could create a spark of static electricity.
- Use combustible gas indicators to monitor the atmosphere, if it is safe to do so.

Responding to Natural Gas Emergencies

- When called for a gas leak or fire, or if you smell gas at an incident scene, **assume there's danger**.
- **Contact NW Natural**. Provide clear directions and a clear path to the incident site.
- **Immediately evacuate** the area.
- **Be alert for migrating gas**.
- **Secure the area to prevent others from entering**. Reroute traffic if necessary.
- **Park emergency vehicles **away and upwind**. Do NOT park:**
 - Over manholes or storm drains
 - Under overhead utility lines



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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 a danger.
- Contact NW Natural 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. Fire or explosion could bring the lines down on your vehicle.

Responding to Natural Gas Emergencies

- **NEVER** attempt to operate underground natural gas pipeline valves or relief vents.
- Turn off gas **ONLY** at an aboveground gas meter service line or appliance supply line.
 - A 1/4 turn with a properly sized wrench will turn off a meter.
 - Use the same procedure 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.
- Inform NW Natural of any gas service line or appliance supply line valve that has been shut off.



Closed gas meter valve



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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 underground natural gas pipeline valves or relief vents. Only utility personnel should operate underground pipeline valves and relief vents.
- Turn off gas at meters or appliance supply lines only. And do so only if you can access them safely.
 - A 1/4 turn will turn off the service line to a gas meter. You can see a good example of this in the photos on this slide. These shut-offs may be hand operated or you may need a wrench. Gas meters are open when parallel to the pipe and closed when perpendicular to the pipe. Don't mistake other valves (such as grease valves) for the meter shut-off.
 - 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.
- Be sure to inform NW Natural of any gas service line or appliance supply line valve that has been shut off.

Indoor Natural Gas Leaks

- Indoor gas leaks can result from **malfunctioning gas-fed appliances**.
- **DO NOT open windows** until you are certain the gas supply has been shut off and ignition sources have been eliminated.
 - Ventilate structures from top to bottom.

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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 and ignition sources have been eliminated. 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.
 - Once you are sure ignition sources have been eliminated and the gas is off, ventilate structures from top to bottom because gas is lighter than air and will rise.
 - Never ventilate structures while personnel are inside. This includes you. Open windows from outside only.

Carbon Monoxide

- **Understanding carbon monoxide (CO) leaks:**
 - CO has no color, odor, or taste.
 - 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. Know the signs:**
 - Flu-like symptoms
 - Loss of consciousness
 - Lips and skin turn blue
- **Get victims outdoors immediately and seek medical attention.**



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Carbon monoxide, or "CO," 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 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 leaks can most often be recognized by these clues: excessive moisture condensation, carbon or soot buildup, or an aldehyde odor inside the home.
- 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 and skin turn blue
- 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.

Outdoor Natural Gas Leaks

- Outdoor natural gas leaks are most commonly caused by **construction-related damage, cracks due to extreme weather, or pipe corrosion.**
- **Contact NW Natural immediately** to shut off the gas.
- **Evacuate the area immediately.** Establish a restricted area.
- **Be alert for migrating gas.** Gas can accumulate in storm drains, construction trenches, buildings, and other utility lines.



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Gas leaks outdoors pose some different challenges than those indoors.

- Outdoor natural gas leaks are most commonly 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 NW Natural 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 immediately. Establish a restricted 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.

Outdoor Natural Gas Leaks

■ Use your senses of sight, hearing, and smell to detect a gas leak. Be alert for these warning signs:

- The distinctive, sulfur-like odor of natural gas
- A hissing, whistling, or roaring sound
- Dirt spraying or blowing into the air
- 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, fire, flood, or other disaster



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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.

- 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, fire, flood, or other disaster.

Natural Gas Fires

- When responding to a fire involving natural gas, **your best and safest course of action is to let it burn.**
- Call NW Natural at 800-882-3377 immediately.
- Evacuate the area and protect exposures if it is safe to do so.
- Do not park emergency vehicles under overhead utility lines.



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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. Allow the gas to burn until the source can be turned off by utility personnel. When the gas supply is depleted, the fire will extinguish itself. Your first priority, as always, is to protect life and property.
- Call NW Natural at 800-882-3377 immediately. They will respond and determine when it's safe for you to proceed.
- Evacuate the area and protect exposures if it is safe to do so.
- 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.

Natural Gas Fires

- For structure fires, **shut off the gas supply only if you can safely access the meter.**
- Once the gas supply is off, **remain alert for gas migration and possible re-ignition.**
- **DO NOT** use water to suppress a natural gas fire. Utility personnel and the incident commander will tell you how to proceed.
 - Use a fog spray to cool and protect combustible exposures.



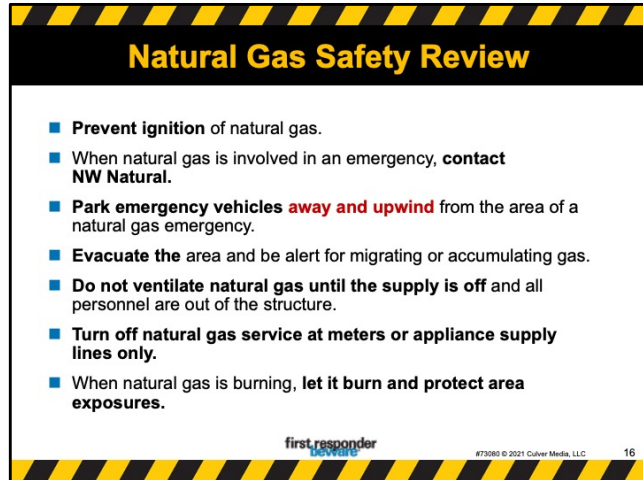
Do not suppress gas fires with water!

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Letting a fire burn is most often the best option unless extinguishing the fire allows access for rescue. 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. It is not effective and may introduce water into gas mains. Utility personnel and the incident commander will tell you how to proceed.
 - Use a fog spray to cool and protect combustible exposures.



Natural Gas Safety Review

- Prevent ignition of natural gas.
- When natural gas is involved in an emergency, **contact NW Natural.**
- 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.
- Turn off natural gas service at meters or appliance supply lines only.
- When natural gas is burning, let it burn and protect area exposures.

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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 NW Natural. 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. Do not park over manholes or storm drains, or under utility lines.
- 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 an aboveground valve by the meter or at an appliance supply line only. Never handle underground pipeline valves or relief 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.

Contact Information

- In case of a natural gas emergency, call **911** and NW Natural at **800-882-3377**.
- For additional information, visit NW Natural's website at **nwnatural.e-smartresponders.com**.
- NW Natural has a program for managing risks to natural gas pipelines. For an overview of their Pipeline Integrity Management Program, visit **nwnatural.com/Business/Safety/Pipeline-Information**.
- To access the NW Natural emergency response plan for your jurisdiction, call **503-610-7236**.

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Here is some contact information that you may find helpful.

- In case of a natural gas emergency, call 911 and NW Natural at 800-882-3377.
- For additional information, visit NW Natural's first responder safety website at nwnatural.e-smartresponders.com.
- NW Natural has a program for managing risks to natural gas pipelines. For an overview of their Pipeline Integrity Management Program, visit www.nwnatural.com/Business/Safety/Pipeline-Information.
- To access the NW Natural emergency response plan for your jurisdiction, call **503-610-7236**.



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 what they would have done differently had they had this training before.

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

NW Natural thanks you for helping to keep first responders safe.