



First Responder Beware[®] Natural Gas Safety Trainer's Guide

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Introduction

The *First Responder Beware* safety program from SMUD is designed to provide firefighters, police, EMTs, and paramedics with the information they need to recognize and work safely around natural gas infrastructure while responding to emergencies.

This trainer's guide will help you make the most of the *First Responder Beware* program. It contains six sections:

- **Know Your Audience.** An overview of first responders' learning preferences.
- **Natural Gas Basics.** Information on how natural gas works.
- **Plan Your Session.** Tips for preparing an effective safety session.
- **Five Steps for an Effective Safety Session.** Step-by-step trainer's guidance.
- **Suggested Simulations.** Activities to help reinforce safety procedures.
- **First Responder Beware Natural Gas Safety Quiz.** Reproducible natural gas safety quiz to help trainers and participants evaluate the program's impact. Answer sheets are provided.

Section One: Know Your Audience

Understanding how first responders learn best will help you tailor your safety session to this unique audience. Take into consideration the following learning preferences:

- **First responders tend to be action-oriented learners** who do best when given an opportunity to practice and repeat recommended behaviors, and they favor a hands-on approach.
- **First responders benefit from significant discussion time**, including opportunities to relate new information to prior experiences and events.
- **First responders are very focused on core priorities:** their own survival, safe and timely rescue of incident victims, and protection of property.
- **First responders respect authority and expertise.** Instructors should have a solid command of the topic and be well organized.
- **First responders are conscientious learners.** If the material is presented as being important to their work and lives, they will be a responsive, eager, and respectful audience.
- **First responders prefer practical (rather than theoretical) information.** Keep the focus on real-life situations.

Section Two: Natural Gas Basics

This section will help trainers answer questions about natural gas from session participants. If you need additional information, please contact SMUD before your safety session.

What Is Natural Gas?

Natural gas, like petroleum, is a fossil fuel. It is found in pockets deep underground and is harvested by drilling. Here are some basic properties of natural gas:

- Natural gas can be ignited by a small spark or flame—even a lit cigarette.
- Natural gas burns within a specific concentration range called the **explosive range** or **flammable range**: between about 5% and 15% gas to air. At the ideal 10% concentration, natural gas burns cleanly.

- Natural gas is lighter than air. It will rise vertically and dissipate into the air if unconfined. When trapped underground or in enclosed spaces, natural gas will move laterally or migrate upward.
- Natural gas is naturally odorless. Natural gas distribution utilities use chemical odorants to give the gas the familiar sulfur-like smell. Gas that has been treated with these chemicals is odorized. However, in some situations this odor may not be apparent.
- Many natural gas transmission companies do not odorize natural gas transmission lines.
- Natural gas is nontoxic. However, natural gas in confined spaces can displace oxygen, creating an asphyxiation hazard.

The Natural Gas Transmission and Distribution System

To harness and transmit natural gas, we use millions of miles of pipes. There are three types of pipes used in the system: transmission pipelines, main lines (often referred to as distribution lines), and service lines.

Transmission pipelines move natural gas from refining plants across long distances. They are the largest pipelines. Note that natural gas in some transmission lines has not yet been treated with odorants and thus has no smell. Main lines carry natural gas from transmission pipelines into residential and commercial areas where it will be used. Service lines bring natural gas from main lines to individual structures.

Between gas lines and individual structures are gas meters. Meters regulate the flow of gas into structures. Different types of structures require different types of meters.

Pressure, created at various points along the lines, moves the gas through the pipes. The size of natural gas lines varies greatly from less than 1 inch to as much as 4 feet in diameter; the pressure can vary from ¼ pound per square inch to 1,000 pounds per square inch. The size of a gas line is NOT a reliable indicator of the internal pressure.

Section Three: Plan Your Session

A well-organized, informed instructor will gain participants' respect and be far more effective. Below are some recommendations to help you prepare for the natural gas safety session with confidence.

Know Your Material

Always preview the materials before showing them to session participants. Gathering information in advance can be useful and make these materials more relevant. Review all the materials and rehearse your presentation well before the session.

Make the Material Relevant

Identify the key natural gas infrastructure that first responders in your session may encounter when responding to emergencies, and focus the group's attention on these topics:

- **What emergency situations** bring them close to natural gas distribution and/or service lines?
- **Where are the natural gas transmission lines** in your area?
- **What natural gas hazards** have participants encountered in the past? Recently?

Tailor the Session to the Meeting Space, Audience Size, and Allotted Time

Consider the size of the meeting space and audience. A large group will require different media than will a smaller one. If the room size is very large for the group, be sure it is arranged as intimately as possible to keep all participants involved.

Remember that first responders are hands-on, action-oriented learners. The session will need to include opportunities to simulate recommended practices and to discuss potential applications of the material. Room size and arrangement can have a measurable impact on the participation level.

Consider:

- **Will all materials be visible** to all participants, or do you need additional space or equipment?
- **Are the seats arranged in a way** that will foster discussion?
- **Is there adequate space** for participants to conduct simulations?
- **Is there adequate lighting** for all participants to see the instructor and materials and to take notes if necessary?
- **Will everyone be able to hear?**

Just as room size and arrangement can affect participation levels, so too can session duration. No one learns well sitting for long periods. On the other hand, cramming too much information into a short session can reduce retention. Plan your session to allow time for discussions and simulations.

- **If there is not time for all the materials**, which ones will be most effective for these participants?

Section Four: Five Steps for an Effective Safety Session

Follow these steps for a high-impact meeting that will keep participants involved and reinforce essential safety information:

1) Advertise the Meeting

Post a notice well in advance of the meeting in a highly visible location.

2) Pass a Sign-In Sheet

Keep attendance records of all safety meetings because someday you may have to show who attended the meeting, what the session covered, and when it was held.

3) Offer an Overview

Tell participants what you will cover in the meeting and what you hope they will learn. This is a good time to convey the importance of this information—that it can help protect first responders, incident victims, and bystanders from natural-gas-related injury or death.

4) Present the First Responder Beware Materials

Discuss the utility safety information in these materials and what natural gas emergencies participants might encounter. Ask participants to review their notes on the materials periodically to refresh their memory of the vital safety tips.

These materials use different types of first responders to exemplify different situations. You might preface them by pointing out that first responders of any discipline could be first on the scene in any emergency. Ask participants to pay special attention to how the information can be applied to their areas of expertise and emergencies they will encounter.

5) *Discussion and Activities*

Participants will retain more information if they get involved in activities and discussions. Ideally, these exercises should be dispersed throughout the session. Here are some ideas:

- **Remind participants of the circumstances of any natural-gas-related emergencies in your region.** Discuss how information in the materials is relevant.
- **Review the warning signs of a natural gas leak,** and discuss how conditions at an incident scene (such as line pressure, different types of structures, population density, and other factors) might inform their responses.
- **Invite first responders to ask questions** about the materials and the safety procedures they outline. If they have questions you can't answer, research the answers yourself and give them that information as soon as possible.
- **Ask participants to brainstorm a list of key safety issues** identified in the materials. Review these key issues and discuss incidents that resulted when related safety precautions were ignored. What were the consequences?
- **Conduct tabletop simulations of various emergency scenarios.** Use toy vehicles and figures to simulate appropriate actions: where to park, how to avoid ignition hazards, and where to place emergency personnel and bystanders.
- **Ask each participant to name one thing they learned** from the materials or discussion that will help them be safer in the future.

Section Five: Suggested Simulations

Practice is essential to first responders' survival and to the successful resolution of emergency situations. Because there is often little time to think, proper habits can save lives.

(Please note: The scope of this program is limited and does not include specialized devices and equipment. Some departments may use specialized equipment for detecting and/or ventilating natural gas. Follow departmental SOPs regarding specialized equipment.)

Tabletop Simulations

The use of tabletop models provides opportunities for small-group collaborations and for simulating multiple scenarios. This approach can be adapted to various room conditions and time constraints. Use of toy figures and scale models allows simulations to be easily reset for repetition. Possible scenarios include the following:

- **Model indoor natural gas leak response tactics.** Have participants demonstrate proper tactics, such as checking for gas migration, parking emergency vehicles, avoiding spark hazards, evacuation strategies, and use of standard communications devices.
- **Model outdoor natural gas leak response tactics** in residential, rural, commercial, and industrial zones. Have participants identify the source of the leak in different environments. Practice checking for gas migration, parking emergency vehicles, avoiding spark hazards, evacuation strategies, and use of standard communications devices.
- **Place model infrastructure items, such as natural gas pipelines, meters, etc.,** around structures, and ask participants to "arrive" at that scene and identify these pieces of natural gas infrastructure.
- **Describe a scenario where a natural gas fire is taking place.** Have participants demonstrate responding to different hazards and conditions.

Role-Play Simulations

Role-play simulations are ideal for practicing first-aid techniques and detailed physical actions.

- **Practice responding to indoor natural gas leaks.** Provide scenarios where a leak has been reported, as well as those where responders must detect the presence of natural gas and locate its source. Be sure to include scenarios where the source cannot be identified.
- **Use signs to identify spark hazards, possible leak sources, and gas infrastructure.** Focus on proper communications, evacuation, and ventilation strategies, with special consideration given to migration, spark, and explosion hazards.
- **Practice identifying CO poisoning.** Have one participant be the victim and have others locate and diagnose whether CO is a factor. If your department trains in lifesaving techniques, include them here.
- **Practice responding to outdoor natural gas leaks.** Provide scenarios where a leak has been reported, as well as those where responders must detect the presence of natural gas. Be sure to include a scenario where the source cannot be identified. Use signs to indicate telltale evidence of a leak. Remember that not all natural gas leaks are detectable by smell alone and that the senses of sight and hearing must also be used to detect leaks.
- **Practice the correct response tactics for natural gas fires.** Use signs to mark possible areas of migration and accumulation, as well as reignition hazards.

Remember that simulations are intended to reinforce proper behavior—*not* to call out or embarrass participants. Maintain a cooperative, supportive atmosphere at all times, and encourage participants to ask questions and provide feedback about how simulations might be most effective.

Section Six: *First Responder Beware* Natural Gas Safety Quiz

The quiz on the next page is intended to help instructors and participants gauge the program's effectiveness. By administering it before beginning the session and then at the end of the session, trainers and participants alike can observe learning in action. The quiz is designed for two-sided photocopying.

Natural Gas Safety Quiz Answers

- | | |
|------|-------|
| 1. A | 6. A |
| 2. C | 7. B |
| 3. B | 8. C |
| 4. D | 9. A |
| 5. D | 10. D |

Name: _____

Date: _____

***First Responder Beware* Natural Gas Safety Quiz**

Before

Questions

After

_____ **1. True or false? Natural gas is lighter than air.** _____

- A. True
- B. False

_____ **2. Which of the following is the approximate explosive (flammable) range of natural gas?** _____

- A. 2% to 5% gas volume in air
- B. 10% to 30% gas volume in air
- C. 5% to 15% gas volume in air
- D. 50% to 60% gas volume in air

_____ **3. Which type of pipeline carries natural gas from the refineries across long distances?** _____

- A. Service
- B. Transmission
- C. Main
- D. None of the above

_____ **4. Which of the following devices should NOT be used in the vicinity of a gas leak?** _____

- A. Garage door openers
- B. Doorbells
- C. Light switches
- D. All of the above

_____ **5. When arriving at the scene of a natural gas emergency, where should you park your vehicle?** _____

- A. As close to the scene as possible
- B. Away from storm drains and manholes
- C. Upwind from the area
- D. Both B and C

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_____ **6. When is it appropriate to shut off natural gas service?** _____

- A. When you can safely reach the gas meter or appliance supply line
- B. When you can access a major pipeline valve
- C. When you can access a relief vent
- D. Never

_____ **7. True or false? When the incident is resolved, you can safely restore natural gas service.** _____

- A. True
- B. False

_____ **8. If natural gas is burning, you should:** _____

- A. Evacuate the area
- B. Protect area exposures
- C. Both A and B
- D. Attempt to extinguish the fire with water

_____ **9. True or false? When trapped in enclosed spaces, natural gas will move laterally or migrate upward.** _____

- A. True
- B. False

_____ **10. When ventilating natural gas from a structure, you should:** _____

- A. Remove all ignition sources before ventilation proceeds
- B. Begin at the top of the structure and work down
- C. Open windows from the outside only
- D. All of the above