

Contractor Beware Trainer’s Guide

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Introduction

The *Contractor Beware* training program from Pacific Gas & Electric Company is designed to provide contractors with the information they need to work safely around overhead and underground power lines and near natural gas pipelines. This program includes a booklet, brochure, poster, and DVD containing two videos and a slide show presentation with speaker's notes.

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

- **Know Your Audience.** An overview of contractors' learning preferences.
- **Utility Basics.** Information on how electricity and natural gas work and some terms to know.
- **Plan Your Session.** Tips for preparing an effective training session.
- **Your Six-Step Training for Survival.** Step-by-step training guidance.
- **Before and After Quiz.** Reproducible utility safety quiz to help trainers and participants evaluate the program's impact.

Section One: Know Your Audience

Understanding how contractors learn best will help you tailor your training session to this unique audience. Take into consideration the following:

- **Contractors are very focused on working efficiently.** Contractors may face pressure to cut corners where safety is concerned in the interest of saving time and money. Acknowledging this from the start—and cautioning against it—will put you all “on the same page.”
- **Contractors tend to be action-oriented learners** who do best when given an opportunity to practice and repeat recommended behaviors.
- **Contractors prefer practical (rather than theoretical) information.** Keep the focus on real-life situations.

Section Two: Utility Basics

This section will help trainers answer questions about electricity and natural gas from session participants.

What Is Electricity?

Electricity results from the flow of electrons between atoms that occurs when atoms carry different charges. Electrons are negatively charged and flow to positively charged atoms until the charge is level or neutral.

- The flow of electrons is called **current**.
- The force propelling the flow of electrons is measured in **voltage**, or **volts** for short.
- The rate at which electricity moves is called **amperes**, or **amps** for short.
- When an object or substance limits the flow of current, this property is called **resistance**. Resistance is measured in **ohms**.

- Materials with a high level of resistance are called **insulators**. Common insulators include plastics, rubber, paper, and air. These materials do not allow electricity to pass through them easily. (However, even insulators can conduct electricity under certain conditions.)
- Materials with a low level of resistance are called **conductors**. Common conductors include water, most metals, and the human body. Electricity can pass easily through these materials under almost all conditions.

How Does Electricity Work?

To better understand how and why electrons flow, consider that water will always come to level. When two containers hold different quantities of water, the water naturally flows from the larger to the smaller quantity until equilibrium is reached.

This same principle applies to electrons. In a battery, two separate chambers contain different numbers of electrons, and electrons flow into the chamber with the smaller concentration until the levels become equal.

To harness electricity, we use wires to control and transmit electrons. The amps of a current depend on the size of the wire. The thicker the wire, the lower the resistance and the greater the flow.

By positioning materials with varying degrees of resistance within the current, we can extract energy in the forms of heat and light. For example, the metal coil within a light bulb adds moderate resistance to a current, generating energy in the form of light.

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 ignites at 900° Fahrenheit, the temperature at which a cigarette burns.
- Natural gas burns within a specific concentration range: between 5% gas to air and 15% gas to air. At the ideal 10% concentration, natural gas burns cleanly.
- Natural gas is lighter than air. Whenever possible it will rise. If contained, it will move laterally, seeking an upward path.
- Natural gas is odorless. Its rotten-egg smell is the result of chemical odorants.
- Natural gas is nontoxic.

How Does Natural Gas Work?

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, and service lines.

Transmission pipelines move natural gas from refining plants across long distances. Note that natural gas in 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.

Pressure, created at various points along the lines, moves the gas through the pipes. The size of natural gas lines varies greatly from 1 inch to 4 feet in diameter; the pressure can vary from ¼ pound per square inch to 1000 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 utility safety training 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 training materials more relevant. Review all the materials and rehearse your presentation well before the session.

The *Contractor Beware* program includes five components. You may choose to use all or some as time and your training priorities dictate:

- **Slide show.** Approximately 10 minutes long, this presentation is designed to introduce basic safety information before viewing the other program materials. It includes talking points for each slide.
- **Book.** This 8-page book is intended for distribution to all session participants. It reviews all the material in the slide show.
- **Poster.** This provides a condensed overview of the program content for display in the session room and/or a prominent location where it will serve as a long-term reminder for session participants.
- **Brochure.** The tri-fold brochure can be kept in company vehicles or at job sites for quick reference and review.
- **Videos.** The 15-minute *Contractor Beware* video features testimonials from real workers hurt on the job by contact with utility lines. The 19-minute *Safely Exposing Underground Utilities* includes tips for excavation planning and proper techniques for exposing buried utility lines.

Make the Material Relevant

Identify the key situations that contractors in your training session may encounter, and focus the group's attention on these topics during training:

- **What job site situations** bring them close to overhead power lines?
- **What type of long or tall equipment do they use** that might come in contact with overhead power lines?
- **What type of digging activities** might bring them close to underground power and/or natural gas lines?
- **What utility hazards** have participants encountered in the past? Recently?

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

Remember that contractors 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 a TV or computer screen be visible** to all participants or do you need a screen and projector?
- **Is there a place to hang the poster** where all participants can see it and have an opportunity to review its contents?
- **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 and audience size can impact the effectiveness of training, so can session time. 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.

- **After the slide show, will there be time to view the video or videos in their entirety?** If not, which sections are most important?
- **Can review of the poster and brochure** be folded into a discussion session without reducing their impact?
- **If there is not time for all the materials,** which ones will be most effective for these participants?

Section Four: Your Six-Step Training for Survival

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, some day, you may have to show who attended the meeting, what the session covered, and when it was held.

3) Begin the slide show presentation with 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 keep contractors, their co-workers, and the public safe from utility-related injury or death. The slide show presentation is approximately 10 minutes long. The presenter's notes provide slide-by-slide talking points.

4) Show the Contractor Beware and/or Safely Exposing Underground Utilities videos

The *Contractor Beware* video is 15 minutes long and the *Safely Exposing Underground Utilities* video is 19 minutes long.

5) Hand out the Contractor Beware book and/or brochure, and hang the Contractor Beware poster

Discuss the utility safety information in these materials and what electricity and natural gas emergencies participants might encounter. Point out that the utility safety tips reinforce the tips in the presentation and videos. Ask participants to review the book, brochure, and poster information periodically to refresh their memory of the vital safety tips.

6) Discussion and simulation

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 recent power line or natural gas line contacts** in your region. Discuss how information in the materials is relevant to those incidents.
- **Stress the importance of contractors keeping themselves, their tools, their equipment, and their vehicles at least 10 feet* from overhead power lines.** Discuss how this rule particularly applies to them and situations they may encounter.
**Higher voltages require greater clearances; please check with Pacific Gas & Electric if you are unsure about the clearances for various types of lines in your area.*
- **Review the proper “Call Before You Dig” procedures and the utility color code.** Discuss why following the law and allowing extra time for a utility locate can save time and money in the long run.
- **Invite participants 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?
- **Ask each participant to name one thing he or she learned** from the materials or discussion that will help him/her be safer in the future.

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 Five: Utility Safety Quiz

The quiz on the next page is intended to help instructors and participants assess the program's effectiveness. Administer it before beginning the training, and ask participants to record their answers in the “Before” column. Then administer it again at the end of the session and ask participants to list answers in the “After” column. The quiz is designed for two-sided photocopying.

Contractor Beware Utility Safety Quiz Answers:

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

Name: _____

Date: _____

Contractor Beware Utility Safety Quiz

Before

Questions

After

1. What is the *minimum* safe clearance from overhead power lines?

- A. 6 inches
- B. 100 feet
- C. 10 feet
- D. 5 feet

2. If you suspect a natural gas leak, you should

- A. Bury your excavation
- B. Use your cell phone or radio
- C. Attempt to shut off the gas supply
- D. None of the above

3. If you must work closer than the safe clearance distance from overhead power lines, which of the following should you do?

- A. Attempt to disconnect electrical service
- B. Call PG&E in advance to make arrangements
- C. Evacuate bystanders
- D. Both A and C

4. What is the best way to determine the location of underground utility lines on a job site?

- A. Look for right-of-way markers
- B. Check your maps
- C. Ask the property owner
- D. Call the one-call utility locator service

5. How should you assist a co-worker who contacts a power line while operating heavy equipment?

- A. Lift them off the equipment
- B. Call 911 and PG&E
- C. Pull them out with a nonconductive rope
- D. Encourage them to exit the equipment normally

6. What is the job of a spotter?

- A. To guide a load
- B. To keep equipment operators away from power lines
- C. Both A and B
- D. None of the above

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_____ **7. Which of the following is a warning sign of a natural gas leak?** _____

- A. A rotten-egg smell
- B. Bubbling in a pond or creek
- C. A hissing sound
- D. All of the above

_____ **8. If your equipment contacts a power line and you are not in imminent danger, you should:** _____

- A. Move the equipment away from the line if possible.
- B. Stay put and warn others to stay away
- C. Have someone contact 911 and PG&E
- D. All of the above

_____ **9. True or false? Service drop wires are insulated to prevent electrical shock.** _____

- A. False
- B. True