Rhode Island Energy®
a PPL company

First Responder Beware®

Electrical safety instructor's guide

Contents

Introduction

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

This instructor'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
- **Utility basics.** Information on how electricity works
- **Plan your session.** Tips for preparing an effective safety education session
- **Your five-step plan for survival.** Step-by-step program guidance
- **Suggested simulations.** Activities to help reinforce safety procedures
- **Before and after quiz.** Reproducible electrical safety quiz to help instructors and participants evaluate the program's impact. (Answers are provided.)

Section one: Know your audience

Understanding how first responders learn best will help you tailor your safety education 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 during instruction,** 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: Electricity basics

This section will help instructors answer questions about electricity from session participants. If you need additional information, please contact Rhode Island Energy before your session.

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 plastic, 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.

The electrical distribution system

Electricity is generated at power plants. A thick coil of wire spins inside giant magnets at the plant, moving the electrons in the wire and making electricity flow.

Wires on tall transmission towers carry high-voltage electricity from power plants to substations, where the voltage is reduced. From substations, electricity travels on smaller wires that branch out down streets, either overhead or underground.

Overhead and underground power lines carry electricity to transformers on poles or on the ground, where the voltage is reduced again to a level that is safe for typical use. From transformers, electricity travels into buildings through service drop wires. These connect to the meter and to all the wires that run inside walls to outlets and switches.

Note that electric-line workers receive extensive training and are experts in handling power lines. They also have special equipment for handling electrical infrastructure. First responders should understand that even with training, their understanding of electricity is basic, and their equipment, even if it appears insulated, is not designed or tested to prevent electrical shock.

Section three: Plan your session

A well-organized, informed instructor will gain participants' respect and be far more effective. This section provides recommendations to help you prepare for the electrical safety education 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 safety education materials more relevant. Review all the materials and rehearse your presentation well before the session.

Make the material relevant

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

- **What emergency situations** bring them close to downed power lines?

- **What type of long or tall equipment do they use** that might come in contact with overhead power lines?
- **Where are the electric substations** in your area?
- **Are there battery energy storage systems (BESS)** in your area?
- **What electrical hazards** have participants encountered in the past? Recently?
- **What experience do participants have with electrical shock victims** and how much do they know about the severity, nature and proper response to shock and burn injuries?

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 the room 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 these questions:

- **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?**
- **How much do you have time for?** Just as room and audience size can impact the effectiveness of instruction, 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. If there is not time for all the materials, which ones will be most effective for these participants?

Section four: Your five-step plan 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 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 utility-related injury or death.

4) Present the First Responder Beware *materials*

Discuss the utility safety information in these materials and what electricity-related 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 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 electricity-related emergencies in your region.** Discuss how information in the materials is relevant.
- **Stress the importance of first responders 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. Also discuss how downed lines require 30-foot to 100-foot clearances because wires can jump and move with wind or when sparking and because the ground may be energized.

  **Higher voltages require greater clearances; please check with Rhode Island Energy if you are unsure about the clearances for various types of lines in your area.*
- **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 manage aerial equipment around overhead power lines 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 the successful resolution of emergency situations. There is often little time to think, and proper habits can save lives.

(Please note: The scope of this program is limited and does not include specialized devices and equipment. Follow departmental standard operating procedures regarding specialized equipment.)

Tabletop simulations

The use of tabletop models provides opportunity 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:

- **Stage a car accident using toy cars and small wires.** Have participants use toy figures to act out proper procedures beginning with arrival on the scene through a rescue of the occupants in an energized vehicle.
- **Simulate conditions after a serious storm where lines have fallen.** Use figures to practice proper procedures.
- **Practice where to park, how to manage aerial equipment around overhead lines (or rooftop photovoltaic panels [PV]) and where to place emergency personnel and bystanders** using toy fire trucks, police cars and ambulances.
- **Stage a variety of electrical infrastructure fires.** These could involve a substation, power line or underground vault. Ask participants to use figures to demonstrate appropriate actions.
- **Place model infrastructure items such as electric meters, service drops, etc.,** around structures and ask participants to "arrive" at that scene and identify these pieces of electrical infrastructure.
- **Describe various scenarios where a drone might be used.** Have participants demonstrate their understanding of department SOPs for drone operation. Be sure to remind participants to keep drones *at least* **200 feet away** from power lines and other electrical equipment.

Role-play simulations

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

- **Practice proper jump-and-shuffle technique** for exiting energized equipment. Jump clear of the vehicle or equipment, and land far enough away that you don't touch the equipment and the ground at the same time. (If you touch the equipment and the ground at the same time, you will become electricity's path to the ground and could be killed.) Land with your feet together and shuffle away with small movements, keeping your feet close together and on the ground at all times. Do not run or take long steps; if your legs bridge two areas of the ground with different voltage, electricity could travel up one leg and down the other. This is because electricity spreads out in the ground with decreasing voltage from the point of contact.
- **Place signs around the room that read "electric meter," "downed wires" and "overhead lines"** and have participants enter the room. Time how long it takes them

to locate the infrastructure and respond appropriately.

- **Practice responding to a vehicle-pole incident** where downed power lines are known or suspected. Emphasize that participants should not contact the vehicle or the power line.

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* electrical safety quiz

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

Electrical safety quiz answers

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

Name: _____ **Date:** _____

First Responder Beware electrical safety quiz

Before	Questions	After
_____	**1. Which of the following should you do when you suspect electrical infrastructure is involved in a fire?** A. Attempt to disconnect electric service B. Contact Rhode Island Energy C. Secure the area and evacuate bystanders D. Both B and C	_____
_____	**2. Which of your standard-issue protective gear will reliably insulate you against electrical shock?** A. Your gloves B. Your helmet C. Your boots D. None of the above	_____
_____	**3. What is the *minimum* clearance distance you should maintain between overhead power lines and emergency equipment?** A. 10 feet B. 100 feet C. 6 inches D. 200 feet	_____
_____	**4. True or false? You cannot always tell whether PV arrays, power lines or objects are energized.** A. True B. False	_____
_____	**5. How should you assist someone who is in a vehicle that is in contact with downed power lines?** A. Lift them out of the vehicle B. If they are in imminent danger, instruct them to jump clear of the vehicle and shuffle away C. Pull them out with a non-conductive rope D. Encourage them to exit the vehicle normally	_____

Before		**After**
_____	**6. When is it appropriate to disconnect electric service?** A. When you can reach the electric meter B. When you can cut power lines C. When you can access a manhole D. Never	_____
_____	**7. True or false? Your body can conduct electricity.** A. True B. False	_____
_____	**8. If your equipment contacts a power line and you are not in imminent danger, you should** A. If possible, safely move the equipment away from the line B. Stay put and warn others to stay away C. Have someone contact Rhode Island Energy D. All of the above	_____
_____	**9. If a substation, transformer or BESS is burning, you should** A. Enter the substation unescorted B. Evacuate the area C. Protect area exposures D. Both B and C	_____
_____	**10. True or false? Burning electrical equipment is difficult to replace and should be saved.** A. True B. False	_____