

ELECTRICITY: GIVE IT SOME RESPECT

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation. Featured are:

INTRODUCTION: A brief description of the program and the subject that it addresses.

PROGRAM OUTLINE: Summarizes the program content. If the program outline is discussed before the video is presented, the entire program will be more meaningful and successful.

PREPARING FOR AND CONDUCTING THE PRESENTATION: These sections will help you set up the training environment, help you relate the program to site-specific incidents, and provide program objectives for focusing your presentation.

REVIEW QUESTIONS AND ANSWERS: Questions may be copied and given to participants to document how well they understood the information that was presented. Answers to the review questions are provided separately.

ATTENDANCE RECORD: Document the date of your presentation as well as identify the program participants. The attendance record may be copied as needed.

INTRODUCTION

Electricity is so common in our lives that we often take it for granted. This can cause us to disregard its power. In fact, every year more than 1,000 people are killed and another 30,000 are injured in electrical mishaps. We are all familiar with the great things electricity can do for us, but we also need to know what it is and how it works in order to use it safely.

This video is designed to provide basic electrical safety training for employees who work around electrical equipment but aren't qualified electricians. Featured are several injury reenactments that illustrate the consequences of committing unsafe acts with and around electricity. Training topics of the program include electrical insulators and conductors, circuits and circuit-breaking devices, how electricity is measured, basic electrical terminology, safe work practices for work around electrical equipment, awareness of electrical hazards and responding to electrical injuries.

PROGRAM OUTLINE

CONDUCTORS

- Conductors are materials that allow electricity to flow through them easily. Most metals are good conductors, including silver, copper, gold, aluminum and iron.
- Water is another good conductor because it contains dissolved salt and minerals. Our bodies are about 70 percent water, making us good conductors too.

INSULATORS

- Insulators are materials that hold back the flow of electrical current. They are sometimes called non-conductors.
- The outside of an extension cord is made of rubber, a good insulator. On the inside is copper wire, a good conductor. The electricity flows through the copper wire and the insulator keeps it there; if the insulation was damaged and you grabbed the cord, the electricity could jump to your body and do some serious damage.
- An important thing to remember is that certain conditions can cause insulators to become conductors. For example, an insulator such as a dry two-by-four will become conductive if it is wet, dirty, painted, varnished or treated with preservative.

CIRCUITS & PROTECTIVE DEVICES

- In most uses, electricity flows in a pathway called a circuit. Circuits typically have a source of electric power, a conductor like copper wire, a load such as a motor or light and a switch.
- A short circuit is when electricity unexpectedly takes a new path with much less resistance and bypasses the load or switch in a circuit. This can produce a dangerous electrical surge with intense heat.
- Fuses and circuit breakers are protective devices that stop the flow of electricity when it reaches a dangerously high level. Circuit breakers and fuses help protect equipment and prevent fires, but they won't protect a person from getting shocked.
- Another important protective device is the ground fault circuit interrupter, which can be located in outlets or in a portable cord.
- Ground fault circuit interrupters, called GFCI's, detect very small changes in current and almost instantly stop the flow of electricity. Because they work so quickly and respond to small changes in current, they can protect a person from shock.

MEASURING ELECTRICITY

- One of the most common terms in measuring electricity is voltage, which is the force that moves electrons in the current. 110 volts is found in typical wall outlets and in some industrial equipment and lighting.
- You may also work around equipment that uses higher voltages such as 240, 277 or 480 volts. High voltage circuits such as these can be especially dangerous.
- No one should be involved with these circuits unless they are licensed electricians who are qualified to work with high voltage circuits.
- Watts is a term you see on a variety of electrical devices. Watts tells you how much electricity the device consumes; the higher the watts, the more power it uses.
- The amount of electrical current is measured in amperes, usually called amps.
- You should remember that the greatest danger is from the amount of electrical current, the amps. In fact, less than one-tenth of an amp can kill a person.
- Resistance is the ability of a material or device to restrict or resist the flow of current. Resistance is measured in Ohms. Insulators have a lot of resistance; conductors have very little resistance.

TERMS ASSOCIATED WITH THE USE OF ELECTRICITY

- Ground is an important electrical term. Objects are "grounded" if they are connected to the earth with a conductor.
- For example, a barn is grounded when a lightning rod on top of the barn is connected to the ground by a metal cable. If lightning hits the rod, the electric current will go through the cable and into the ground without damaging the barn.
- Grounded tools and equipment are also connected to the earth with a conductor. That's the purpose of the ground prong on a cord.
- The ground prong is connected to a separate grounding wire inside the cord. If there were a short circuit, the surge of electricity would flow safely through the ground wire and into the earth rather than into a person or equipment.

- Shock is what happens to us when electric current passes through our bodies. Shocks can produce quite a range of effects, from mild tingling to severe burns, nerve damage, cardiac arrest and death.
- The two types of electrical current are alternating current (called AC) and direct current (called DC).
- Alternating current is produced at electrical generating plants and is distributed to our homes, businesses and industrial settings. Alternating current is the most widely used type of electricity. It is called alternating current because the current rapidly alternates back and forth in a circuit.
- Direct current flows in only one direction and is the type of current produced by batteries. It's also used in precise electronic control devices.
- Direct current can create hazards. For example, vehicle and forklift batteries that are handled unsafely can produce dangerous sparks capable of igniting gases and causing an explosion.
- Static electricity is an electrical charge that builds up in objects, such as inside a storm cloud or in a person as they walk across a carpet.
- Static electrical charges can range from a tiny spark with very little current to a bolt of lightning carrying several thousand amps of current and several million volts. Even a tiny spark can be dangerous near flammable liquids and in work settings with explosion hazards.
- For this reason, containers and tankers are first grounded with a bonding cable during the transfer of flammables and explosives. This helps prevent the buildup of static electricity and the release of dangerous sparks.

BEING AWARE OF ELECTRICAL HAZARDS

- Staying alert for hazardous conditions in our surroundings is another way we can protect ourselves from electrical mishaps. For example, watch out for missing covers and loose sockets.
- Defective or exposed wiring, disconnected conduits and overloaded circuits are other common hazards to watch for and should be reported to your supervisor so they can be fixed.
- Other hazards such as loose, exposed or cracked wires can be found in walls, ceilings and crawl spaces. These spaces are often cramped and poorly lit, which just increases your risk of injury; to help you spot any hazards, add lighting before you start work.
- Personal protective equipment is also essential. If you're working above your body, use safety goggles to protect against falling debris.
- Cutting into walls can also be dangerous due to the risk of cutting electrical wires. To locate hidden wires, you can review blueprints or as-built drawings as well as using a circuit tracer.
- If you are operating a powered lift or a crane or if you're carrying conductive materials, remember to check above you for hazards, such as overhead power sources.
- Another hazard is wood or fiberglass ladders that are wet. This causes them to become conductive and dangerous to use around electrical sources.
- Remember that wet gloves or footwear can also greatly increase your chance of getting shocked.
- Spills, debris or objects left in dangerous locations are typical hazards some people leave behind. Stay alert for housekeeping problems and arrange to have them cleaned up or clean them up yourself before they cause a problem.

- Wearing conductive items such as watches, jewelry or metal belt buckles can also create hazards. Remove items such as these if you are going to be doing any work around electrical sources.
- Distractions are another common hazard. Staying focused on your work and your safety is your best protection. You can also prevent distractions by avoiding the use of cell phones or pagers in your workplace.
- The wrong frame of mind can cause hazardous behavior, such as taking shortcuts and being inattentive. We should keep our attention focused on our work, avoid shortcuts and make a commitment to safety.

SAFE WORK PRACTICES

- Whether you're on or off the job, it is important that you have been trained and are authorized to do the work. If you have questions, check with your supervisor or hire a qualified electrician.
- Go to the source and turn off the power. Make sure the power can't be turned on accidentally while you're working.
- In many situations, OSHA regulations require that the power be locked out by a person authorized to perform lockout.
- Use your personal protective equipment. Safety glasses with side shields are appropriate in most situations. If you're working around potential electrical sources, the glasses should not contain metal.
- Wearing leather or insulated gloves will give you added protection.
- The correct PPE will vary depending on the situation. If you have any questions, ask your supervisor.
- Using insulated tools will help protect you from electric shock. Double-insulated tools will give even greater protection. Insulated tools are designed to protect against shock up to the voltage level shown on the tool.
- If you are working near any potential electrical sources, use a fiberglass or wooden ladder. Remember that a wood or fiberglass ladder that is wet, very dirty, painted or varnished becomes conductive and reduces its protective qualities.
- Again, before you actually start work, check to be sure the power is off.
- Whether it's water on the floor or in a cup, water and electricity must be kept away from each other. The right way is to keep your work area dry and avoid bringing liquids into the area.
- Be sure to remove water on the floor and make certain the floor is dry before starting work.
- Before starting work, select a high-quality extension cord that is in good condition, is rated to handle the equipment being used and has an intact ground prong.
- Avoid using adaptor plugs which can eliminate the proper ground that will protect you from shock. Use a cord that has been approved by an independent testing laboratory.
- Using a cord with a built-in ground fault circuit interrupter will also provide you with extra protection from shock. In fact, specific OSHA regulations for the construction industry require GFCI's when extension cords are used with power tools.
- Do not turn the power on and off by plugging and unplugging a cord. This practice can cause sparks, create a shock hazard and damage the connections on the cord.

RESPONDING TO AN ELECTRICAL INJURY

- Knowing what to do and what not to do if you come across an electrical mishap can mean the difference between life and death, for the injured person and for yourself.
- For your own safety, don't rush into the situation. You could be injured or killed by electric current, fires, or hazardous debris. How you respond depends on whether the person is still being shocked.
- If the person is no longer being shocked, call for emergency medical help immediately. If you can't, get someone else to call; fast medical attention can make the difference between life and death.
- If the person is still being shocked, you're faced with additional hazards.
- Shock can cause a person to involuntarily hold onto the electrical sources. You may be tempted to grab the person and pull them away, but don't do it! Don't touch them; you could get shocked too.
- If you can, quickly shut off the power and call for emergency medical help. If you can't turn off the power, use a dry, clean, nonconductive object like a piece of plastic pipe to push the person away; then call for help.
- If you are the person being shocked and you can't let go, let your knees collapse. The weight of your body can pull you away from the source of shock.
- Try to calm the person and keep them still until medical help arrives. Don't give the person water because it could cause a stroke. If the person is bleeding, don't touch the blood.

PREPARE FOR THE SAFETY MEETING OR TRAINING SESSION

Review each section of this Leader's Guide as well as the videotape. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Copy the attendance record as needed and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

Here are some suggestions for preparing your videotape equipment and the room or area you use:

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the videotape program.

Place or secure extension cords to prevent them from becoming a tripping hazard.

CONDUCTING THE PRESENTATION

Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is show viewers the consequences of unsafe acts around electrical equipment while demonstrating the basic electrical safe work practices that will keep them safe on the job.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline.

Lead discussions specific equipment and job duties at your facility that present electrical hazards and the steps employees must take to protect themselves from them. Use the review questions to check how well the participants understood the information.

After watching the videotape program, the viewer will be able to explain the following:

- Common electrical terms and components such as conductors, insulators, circuits, grounding, shock alternating current, direct current and static electricity;
- How electricity is measured and the characteristics of these measurements;
- Safe work practices designed to keep employees safe when working near electrical equipment;
- Electrical hazards that workers must always be aware of to prevent deaths and injuries;
- How to respond to an electrical injury.

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REVIEW QUIZ

Name _____ Date _____

The following questions are provided to check how well you understand the information presented during this program.

1. _____ are materials that hold back the flow of electric current.
 - a. Conductors
 - b. Insulators
 - c. Circuits

2. Fuses and circuit breakers help protect equipment and prevent fires as well as protecting people from getting shocked.
 - a. true
 - b. false

3. Which of the following measurements tells you how much electricity an electrically-powered device consumes?
 - a. voltage
 - b. amperes
 - c. watts

4. Alternating current is produced at electrical generating plants and is the most widely used type of electricity.
 - a. true
 - b. false

5. Which of the following would be conductive and hazardous to use?
 - a. a wet wooden ladder
 - b. a painted fiberglass ladder
 - c. a varnished wooden ladder
 - d. all of the above
 - e. none of the above

6. What should you do if you discover any defective or exposed wiring on your job?
 - a. attempt to repair it
 - b. let someone else take care of it
 - c. report it to your supervisor

7. Less than one-tenth of an amp of electricity can kill a person.
 - a. true
 - b. false

8. You don't need to be trained or authorized to perform electrical tasks as long as you are working at home or somewhere else off the jobsite.
 - a. true
 - b. false

ANSWERS TO THE REVIEW QUESTIONS

1. b

2. b

3. c

4. a

5. d

6. c

7. a

8. b