# ABOUT PREVENTING ELECTRIC SHOCK

LENGTH: 12 MINUTES

PROGRAM SYNOPSIS:
Our workplace is full of hazards, hazards that can hurt us or kill us. Controlling these hazards and preventing injuries is the point of our safety and health program. One such hazard is presented by electricity and electrical equipment. Understanding how electricity works and following basic electrical safety practices can prevent injuries and save lives. That is the point of our facility's plan to protect employees from electrical hazards and that is the point of this program. So, pay close attention as we get to the point about preventing electric shock.

Topics include common electrical terminology, avoiding contact with energized parts, ground fault circuit interrupters and responding to a shock event.

PROGRAM OBJECTIVES:
After watching the program, the participant will be able to explain the following:
- How an electric current is created;
- What the terms amp, voltage and Ohm mean;
- How to avoid shock while using power tools and cords;
- What ground fault current is;
- How to properly respond to a shock event.

BACKGROUND
- Electricity is all around us, but the danger it presents is something we often don't think about. This is why our organization has developed a plan to prevent electrical incidents.
- This plan includes engineering controls and work procedures as well as equipment inspections and employee training.
- For our electrical safety program to be effective, all workers must understand and practice basic electrical safety.

HOW AN ELECTRIC CURRENT IS CREATED
- An electric circuit is formed when a conductor is connected to each side of a power source.
- Some examples of power sources include batteries and generators. A standard wall receptacle can also be considered a circuit's power source once a power cord is plugged in.
- A conductor can be any material which allows the flow of electricity. Copper and aluminum are good conductors and are commonly used in electric circuits.
- When a conductor is connected to both sides of a power source, an electric current will flow through the conductor. This flow of electric current is measured in amps.
- It is the flow of electric current that gives electricity its power. The power of flowing electric current is used to create light, make heat, turn motors and perform other useful work when these devices are connected to an electric circuit. Unfortunately, it is this same electric current which can be so dangerous.
- When we inadvertently come into contact with electricity, our bodies can become a conductor and electric current will flow through us.
- The heart is extremely sensitive to electric current and it only takes a tiny amount to disrupt its rhythm or even stop it completely.

VOLTAGE
- Voltage is another important electrical term. Voltage can be thought of as a measure of the potential strength of a power source. Voltage is measured in volts.
- For example, a car battery is typically 12 volts while a standard wall receptacle is typically 120 volts. Overhead power lines are many thousands of volts.
- For a power source with a specific voltage, the amount of current that will flow through an electric circuit depends on the resistance of the circuit.

RESISTANCE
- Resistance is another important electrical term. Resistance is a measure of a material's ability to impede or resist the flow of electric current. The unit of measure for resistance is the Ohm.
- Materials with extremely high resistance, such as plastic and rubber, will not allow the flow of electric current and are commonly called insulators.
- This is why the protective insulation on wire and power cords is made of rubber or plastic. The insulation protects the user from being shocked.

## AVOIDING CONTACT WITH ENERGIZED PARTS

- Under normal circumstances workers are protected from energized parts by properly-installed electrical cover plates, cabinet doors and other protections.
- If you notice any damaged, opened or missing electrical covers or doors, report it right away so this dangerous condition can be corrected.
- For qualified electrical worker, the number one safety rule is to never work on an energized circuit.
- To achieve this, electricians and maintenance workers place locks and tags on the disconnected power supply to ensure that no one turns the power back on.
- At home, everyone should make it a point to follow this important rule by unplugging tools or turning off circuit breakers prior to performing any repairs or maintenance to electrically powered devices.
- Apply a locking device to the circuit breaker to prevent anyone from turning the power back on.
- Never attempt to work on electrical circuits or perform electrical work if you are not qualified to do so.

## POWER TOOLS & CORDS

- Recall that electric power cords and tools are encased in plastic or rubber insulation to protect the user from being shocked.
- Unfortunately, it is not uncommon for this insulation to become damaged, exposing the user to a live conductor.
- Even a small cut or nick in the insulation may allow the user to receive a shock, especially if the cord is being handled with wet or sweaty hands.
- To prevent being shocked, you must inspect all electric power cords, extension cords and tools prior to use.

If faulty equipment is discovered during the inspection, it should be removed from service until it can be repaired or replaced.

- Many power and extension cords are designed to have a ground prong. If this is the case with the cord you plan to use, the ground prong must be in place and in good condition.
- The ground prong is an important safety device. It is part of a continuous “grounding circuit” which will trip a circuit breaker if the outer frame of the tool or equipment becomes energized.
- Some tools offer additional electrical protection by being double-insulated. Double-insulated tools do not utilize a ground prong.

Double-insulated tools are marked with a special symbol. Double insulated tools have a non-conductive outer shell which is insulated from any internal electrical components.

## OVERHEAD & UNDERGROUND CONDUCTORS

- To avoid contacting energized conductors you must be aware that energized conductors may also be overhead and underground.
- When overhead, the only thing protecting you from this hazard is the air between you and the conductor. Overhead conductors have no protective insulation.
- While air does provide some insulation, it is not enough. When a conductive object or material comes too close to an overhead conductor, an electric current can arc through the air and complete the circuit. This is why all conductive objects such as ladders, mobile equipment or poles must be kept at least 10 feet away from overhead conductors.
- Energized conductors are also buried in the ground and digging one up can be a fatal mistake.
- Before conducting any type of digging or excavation project, you must have these lines located and marked so you can take measures to avoid them.

## GROUND FAULT CURRENT

- It’s important to understand that one side of the power source in an electrical system is connected directly into the ground.
- The side of the power source connected to the ground is called the neutral, negative or grounded side, while the ungrounded side is known as the positive or hot side.
- This produces a condition that allows current to flow anytime a conductor, such as your body, contacts a hot conductor and the ground at the same time. This dangerous current flow is known as “ground fault current.”
- Ground fault current is the cause of many electrocutions, especially while using extension cords or power tools with damaged insulation.
- Using these types of tools in wet conditions makes an electrocution even more likely because water greatly decreases the resistance of anything it touches.
- Because the human body is approximately 60 percent water, our bodies are also good conductors of electricity.
- This is why we are so vulnerable to electric shock.

## GROUND FAULT CIRCUIT INTERRUPTERS

- In addition to making sure that your tools and cords are not damaged and avoiding damp or wet conditions, it is the use of a ground fault circuit interrupter that is critical to preventing ground fault electrocutions.
- Ground fault circuit interrupters, or GFCIs, are required in many workplaces anytime an extension cord or hand held power tool is used.
- GFCIs are also built into many receptacles which are located in kitchens, bathrooms or other potentially wet environments.
- A ground fault circuit interrupter continuously compares the amount of current flowing through both the positive and negative conductors. Any difference in these currents represents the amount of ground fault current.
- When a difference of just five milliamps is detected, the GFCI quickly trips, interrupting the circuit and stopping the flow of current.
- Because of its speed and sensitivity, the GFCI will typically trip before you even have any idea there may have been a problem.
- Ground fault circuit interrupters save lives. Make it a point to purchase one for your home and then make it a habit to use it. Let’s next discuss how to respond to a shock event.

RESPONDING TO A SHOCK EVENT

- If you witness a co-worker being shocked, don't panic and rush into action. Take the time to access the situation to prevent being electrocuted yourself.
- If the person is still being shocked, do not grab him or her. This could cause you to also be shocked.
- If possible, turn off the power and summon help immediately. If you can't shut the power off, find a non-conductive object such as dry wooden broom handle or a piece of PVC pipe and push the victim away from the circuit.
- If you are the person being shocked, you may find that you are unable to release your grip.
- If this occurs, allow your knees to collapse and let your body weight pull you away from the circuit.
- Because it is hard to determine the amount of internal damage caused by being shocked, all shock victims should seek immediate medical attention.

**TO THE POINT ABOUT PREVENTING ELECTRIC SHOCK**
***Review Quiz***

**Name_____Date_____**

***Please provide answers to the following to show how well you understand the information presented during this program.***

1. The flow of electric current flowing through a conductor is measured in _____.

a. Amps
b. Ohms
c. Volts

2. Materials that do not allow the flow of electric current have very _____ resistance.

a. High
b. Low

3. How do qualified electrical workers ensure equipment remains de-energized while they are working on it?

a. They unplug it
b. They have a co-worker make sure no one turns on its power
c. They place locks and tags on the disconnected power supply

4. Even a small nick or cut in a power cord's insulation may allow the user to receive a shock.

a. True
b. False

5. Conductive objects such as ladders, mobile equipment or poles must be kept at least _____ feet away from overhead conductors.

a. 3
b. 5
c. 10

6. The side of the power source that is connected to the ground is often called the _____ side.

a. Neutral
b. Negative
c. Grounded
d. All of the above

7. Because the human body is approximately _____ water, our bodies are good conductors of electricity.

a. 30 percent
b. 45 percent
c. 60 percent

8. When a difference of _____ is detected, a GFCI will quickly trip, interrupting the circuit and stopping the flow of current.

a. 5 milliamps
b. 10 milliamps
c. 15 milliamps

9. What should you do if you are being shocked and are unable to release your grip on the object containing the electric circuit?

a. Try to jump away from the object
b. Try to fall backwards
c. Try to allow your knees to collapse

## *ANSWERS TO THE REVIEW QUESTIONS*

1. a
2. a
3. c
4. a
5. c
6. d
7. c
8. a
9. c