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# **ELECTROCUTION HAZARDS IN CONSTRUCTION ENVIRONMENTS PART II: *Employer Responsibilities***

**Leader's Guide, Fact Sheet  
& Quiz**

Item Number: 5089

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

## **PREPARING FOR THE MEETING**

Here are a few suggestions for using this program:

- a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.
- b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.
- c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.
- d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes before the quiz itself, which is on the final page.

## **CONDUCTING THE PRESENTATION**

- a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.
- b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.
- c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.
- d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

## **5089 ELECTROCUTION HAZARDS IN CONSTRUCTION ENVIRONMENTS PART II: *Employer Responsibilities* FACT SHEET**

**LENGTH: 17 MINUTES**

**PROGRAM SYNOPSIS:**

Electricity kills more than a hundred construction workers each year, making electrocution the fourth leading cause of death in the industry. Also, construction workers suffer more than half of all the electrical injuries that occur on the job in this country. To help employers ensure that their employees can work safely with and around electricity, the Occupational Safety and Health Administration (OSHA) has established electrical safety standards for general industry and construction. To avoid accidents and injuries, employees need to understand the different types of electrical hazards that can be encountered on construction sites, the OSHA regulations that address them and the responsibilities that employers have to protect their workers from these hazards. This program reminds employers what must be done on a job site to reduce or eliminate electrical hazards and avoid injury.

Topics include OSHA's electrical standards for construction, overhead power line safety precautions, safe use and inspection of power tools, protecting workers from ground faults, energy isolation, energy guarding and lockout/tagout.

**PROGRAM OBJECTIVES:**

After watching the program, the participant should:

- Understand the OSHA regulations that address the different types of electrical hazards and the potential for electrocution that can be encountered on construction sites.
- Know what an employer is required to do to keep them safe from electrical hazards and electrocution on a job site.
- Understand why strict safety precautions must be taken whenever power lines are present on a job site.
- Know how the proper grounding of electrical tools can prevent accidents and injuries.
- Understand why it is important to inspect power tools and cords before using them.
- Understand the options OSHA's electrical safety regulations give to an employer for reducing ground fault hazards on a construction site.
- Know how equipment guarding and energy isolation can be used to reduce electrical hazards.
- Understand how lockout/tagout procedures help to keep employees safe when working near or performing maintenance on powered equipment.

**PROGRAM OUTLINE:**

**OSHA'S ELECTRICAL STANDARDS FOR CONSTRUCTION**

- **Electrical energy helps construction employees do a lot of useful work on a job site, but it can create serious hazards for them as well.**
- **Electricity kills more than a hundred construction workers annually, making "electrocution" the fourth leading cause of death in the industry.**
  - Construction workers suffer more than half of all the electrical injuries that occur on the job in this country.
- **To help employers ensure that their employees can work safely with and around electricity, the Occupational Safety and Health Administration (OSHA) has established electrical safety standards for general industry and construction.**
  - Like all OSHA rules, they require employers to ensure that their workplaces are "free from recognized hazards that are causing or likely to cause death or serious physical harm" to employees.
- **OSHA's Electrical Safety Standards for Construction require employers to:**
  - Isolate the electricity in a job site's energy control and distribution systems.
  - Restrict access to high-voltage electrical equipment.
  - Implement an Assured Equipment Grounding Conductor Program on each job site or equip the job sites with ground fault circuit interrupters (GFCIs).
  - Ensure that portable electric tools and cords are properly used and maintained.
  - Take precautions to reduce electrocution hazards when work is performed near overhead power lines.
  - Ensure that lock-out/tag-out procedures are followed when workers are servicing electrically-powered equipment.
- **The OSHA Standards also emphasize an employer's responsibility to provide training for all employees on the electrical hazards they can encounter, as well as the equipment and safe work practices they should use to avoid those hazards.**
- **Finally, employers should supply their employees with:**

- Personal protective equipment that is appropriate for the electrical hazards on their job site.
- Training on how to use, inspect and maintain that equipment.

#### **OVERHEAD POWER LINE SAFETY PRECAUTIONS**

- **Overhead power lines can carry up to three-quarters of a million volts of electricity, so coming into contact with one, or even just getting too close to it, can be fatal.**
  - Among construction workers, power lines cause more electrocutions than any other electrical hazard.
- **Under OSHA's Electrical Safety Standards, construction employers must ensure that strict safety precautions are taken whenever power lines are present on a job site.**
- **Even before work begins on the site, the utility company that operates the power lines on the site should be contacted so that the wires can be de-energized and grounded.**
  - If the lines cannot be powered down, the utility company may be able to provide some protection from the energy in the lines by covering them with insulating sleeves, also known as "eels".
- **Contractors should also find out how much voltage is being carried by the lines.**
  - That information can be used to determine just how much clearance workers must give them to avoid electrocution.
- **As a standard operating procedure, employees should always assume that power lines are carrying a lethal amount of electricity and stay at least 10 feet away from them.**
  - For extremely high voltages, an even greater separation is required.
- **This "safe working distance" also applies to tools or materials that workers are carrying, and equipment such as trucks, cranes or lifts that they are operating.**
- **To prevent anything or anyone from getting too close to a power line, the safe working distance should be "marked off" both horizontally and vertically from the wires.**
  - The equipment that is used for this purpose, such as flagged warning lines, caution tape and barricades, must be provided by the employer.
- **Workers should be fully informed about the hazards that are associated with power lines and the precautions that are being taken to reduce those hazards on their job site.**
  - Their employer should also provide workers with appropriate personal protective equipment and make sure that they wear it.

#### **SAFE USE & INSPECTION OF POWER TOOLS & CORDS**

- **Saws, drills, hammers, nailers and other portable tools that are powered by electricity are in constant use on most construction worksites.**
  - So are the extension cords that supply many of them with power.
- **Over time, hard use, misuse as well as unauthorized alterations can cause equipment to become electrically hazardous.**
  - As a result, power tools and cords are involved in a significant number of electrical accidents, injuries and fatalities on job sites.
- **So OSHA requires construction employers to provide training for their workers on the proper maintenance and use of electrical power tools and cord sets.**
- **Employees must understand that safe practices should begin with a thorough inspection for wear or damage.**
  - Tools should be checked for cracked housings and loose, bent or missing parts.
  - Power and extension cords should be examined for exposed wires, cracked insulation and any signs of fraying.
  - If problems are found, the faulty equipment should be taken out of service for repair or replacement.
- **Employers must also make sure that all tools and cords on a site are heavy-duty types that are grounded and rated for outdoor use if necessary.**
- **Proper grounding is particularly important in preventing electrical accidents and injuries.**
  - Any time the circular ground prong has been removed from a "three-prong" electric plug, that equipment should be taken out of service.
- **Even tools and cords that are in good condition can hurt or even kill people if they're misused.**
- **So OSHA requires contractors to ensure that their employees:**
  - Operate electrical equipment according to the instructions that are provided by the manufacturer.
  - Follow safe work practices at all times.
- **For example, tools should always be unplugged before workers change out bits or blades or service them.**
- **Since water conducts electricity, using electrically-powered tools and extension cords in wet conditions should also be avoided whenever possible.**
- **When working in the wet is unavoidable, the tools should be plugged into a ground fault circuit interrupter.**
  - Workers should also know to wear appropriate PPE, including rubber-soled boots and rubber gloves.

## **PROTECTING WORKERS FROM GROUND FAULTS**

- **Electricity is pretty safe when it stays inside the circuits it's supposed to run through.**
- **When circuits become worn or damaged, or when they are misused, the current can jump out of them trying to find its own way to ground.**
  - This is called a "ground fault".
- **Electricity will always seek the shortest and easiest path to "ground".**
  - If that path happens to lead through a person, they can experience a shock, a burn or even be killed.
- **OSHA's electrical safety regulations give construction employers two options for protecting their employees from ground faults:**
  - Create and implement an Assured Equipment Grounding Conductor Program (AEGCP) for each job site.
  - Equip each site with ground fault circuit interrupters (GFCIs).

## **THE ASSURED EQUIPMENT GROUNDING CONDUCTOR PROGRAM (AEGCP)**

- **In an "Assured Grounding Program", designated employees inspect and test electrical equipment on the site regularly to ensure that it is grounded.**
  - This helps make sure that any electricity that "leaks" in faulty equipment can find a safe "internal" path to ground instead of shocking and possibly electrocuting the person using it.
- **An AEGCP will monitor:**
  - All cord sets on a job site.
  - All receptacles that are not part of the permanent wiring of a building or structure.
  - All equipment connected by cords and plugs that employees can use.
- **OSHA regulations require a copy of the written Assured Grounding Program to be available on the worksite, and records of the continuity testing to be maintained as well.**

## **GROUND FAULT CIRCUIT INTERRUPTERS (GFCIs)**

- **In some situations, however, it may not be possible to ensure proper grounding on a worksite.**
  - As an alternative to an Assured Grounding Program, OSHA also allows construction employers to equip their job sites with ground fault circuit interrupters.
  - An important advantage of GFCIs is that they can perform their safety function even when a continuous ground connection is not available.
- **Built into receptacles and extension cords, GFCIs monitor the flow of current in a line to sense when electricity is jumping to ground.**
  - They then work like circuit breakers, cutting off the power in the line in as little as one fortieth of a second.
- **GFCIs can also be built into the breakers in an electric panel to provide ground fault protection for entire circuits on a site.**

## **POWER DISTRIBUTION & CONTROL**

- **For electricity to be used safely and effectively on a construction site, it has to be:**
  - Distributed to different locations on the site.
  - Controlled by devices that turn it on or off as needed.
- **OSHA has established safe work practices for power distribution and control that contractors must follow to reduce electrocution hazards on their job sites, including:**
  - Energy isolation.
  - Equipment guarding.
  - Lock-out/tag-out procedures.

## **ENERGY ISOLATION**

- **Energy isolation ensures that electric current stays safely inside the wires, electric panels, junction boxes and other equipment that distributes it on a job site.**
- **To prevent damage, wiring should be protected from sharp edges and abrasion wherever it enters panels, boxes or other fittings.**
- **To prevent exposure to energized components, unused openings in boxes and fittings should be closed off.**
  - A cover or faceplate should be installed.
  - If the parts are made of metal, they should be grounded as well.
- **High voltage electrical equipment such as transformers, switchgear and distribution boxes can create serious electrocution hazards, especially for workers who are not familiar with how they work.**

## **ENERGY GUARDING**

- **Equipment rated at 50 volts or higher should be kept separate, or "guarded", on a job site.**
  - Guarding allows access to be limited to workers who are qualified and authorized to work with the equipment safely.
- **Equipment can be guarded by locating it:**
  - Inside an enclosure or behind permanent screens.
  - In special rooms, vaults or galleries.
  - On a balcony, elevated platform or other place that is 8 feet or more above the ground.

## **LOCKOUT/TAGOUT**

- **While guarding and isolation can reduce the hazards associated with the distribution of electricity on a job site, "lockout/tagout" procedures focus on where that energy is used.**
- **Whenever electrically-powered equipment needs maintenance or repair, its power should be turned off before the work is performed.**
- **The power has to stay off until it's safe to re-energize the equipment.**
  - Restoring the power too soon could result in the person who is servicing it being injured, even killed, by either the sudden flow of electric current or the moving parts that it sets in motion.
- **To prevent this from happening, lock-out/tag-out procedures:**
  - Standardize the steps that are followed in the power control process.
  - Physically lock a switch in the "off" position until energy can be restored safely.
- **A tag is also applied to the locked switch which explains why the power has been shut off, and who is doing the work on the equipment.**
- **Construction employers must ensure that lockout/tagout power control procedures are followed on their worksites.**
  - They are also responsible for supplying the specialized equipment that is required for lock-out/tag-out, as well as the training that employees need so they know how to use it.
- **Lockout/tagout training should emphasize that when a worker encounters a power switch that has been locked and tagged, they should not tamper with the lock or try to restore the power.**

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**ANSWERS TO THE REVIEW QUIZ**

1. b

2. a

3. b

4. b

5. a

6. b

7. b

8. a

9. a

10. b

## ELECTROCUTION HAZARDS IN CONSTRUCTION ENVIRONMENTS PART II:

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#### **REVIEW QUIZ**

*The following questions are provided to determine how well you understand the information presented in this program.*

Name \_\_\_\_\_ Date \_\_\_\_\_

1. Most of the hundreds of deaths and injuries in the construction industry that involve electricity cannot really be prevented.
  - a. True
  - b. False
  
2. Electricity powers most of the tools and equipment that construction workers use on the job.
  - a. True
  - b. False
  
3. The insulating sleeves that utility companies sometimes use to provide a degree of protection from live power lines are called “conduits”.
  - a. True
  - b. False
  
4. When determining the “safe working distance” that workers should keep from a power line, you don’t have to consider the tools or materials that they may be using.
  - a. True
  - b. False
  
5. Tools and cords that are in good condition can hurt, even kill people if they are misused.
  - a. True
  - b. False
  
6. Neither hard use, misuse or unauthorized alterations will normally cause equipment to become electrically hazardous.
  - a. True
  - b. False
  
7. A disadvantage of GFCIs is that they can’t function when a continuous ground is not available.
  - a. True
  - b. False
  
8. OSHA regulations require that a copy of a job site’s written Assured Grounding Program to be available to all employees on the site.
  - a. True
  - b. False
  
9. Wiring should be protected from sharp edges and abrasion wherever it enters panels, boxes or other fittings.
  - a. True
  - b. False
  
10. Lockout/tagout procedures ensure that electric current stays safely inside the wires that distribute it throughout a job site.
  - a. True
  - b. False