

**ELECTRICAL HAZARDS:
One of Construction's Fatal Four
FACT SHEET**

LENGTH: 12 MINUTES

PROGRAM SYNOPSIS:

In an effort to reduce the high number of injuries and deaths that occur on construction sites, the Occupational Safety and Health Administration, OSHA, has identified the four most common causes of injuries and fatalities in construction. Known as the "Fatal Four" or the "Focus Four," these hazards include struck-by hazards, caught-between hazards, fall hazards and electrocution hazards. There are three major types of electrocution hazards in the construction industry: contact with power lines, contact with energized sources and the improper use of extension and flexible power cords. This program explains the safe work practices that construction workers must follow to protect themselves from these hazards.

Topics include maintaining safe distances from power lines, the effects of electrical shock, how electrical burns can occur and be avoided, ground fault circuit interrupters (GFCIs), safety precautions for working on electrical equipment and safe use of extension and flexible power cords.

PROGRAM OBJECTIVES: After watching the program, the participant will be able to explain the following:

- How to protect themselves from the dangers of overhead power lines;
- How electrical shock can occur and what its effects can be;
- How electrical burns can occur and be avoided;
- What the three types of ground fault circuit interrupters (GFCIs) are and how they are used;
- Which safety precautions to follow when working on electrical equipment;
- How to use extension and flexible power cords safely.

INSTRUCTIONAL CONTENT:

BACKGROUND

- As a construction worker, you already know that the jobsite can be dangerous. In fact, over 5,000 construction workers are killed and over 150,000 are injured each year.
- In an effort to reduce the high number of construction-related incidents, the Occupational Safety and Health Administration, OSHA, has identified the four most common causes of injuries and fatalities in construction.
- Known as the "Fatal Four" or the "Focus Four," these hazards include struck-by hazards, caught-between hazards, fall hazards and electrocution hazards.

ELECTROCUTION HAZARDS: One of the Fatal Four

- There are three major types of electrocution hazards in the construction industry:
 - Contact with power lines,
 - Contact with energized sources,
 - The improper use of extension and flexible power cords.

POWER LINES

- Energized power lines are particularly dangerous to construction workers, not only because they carry extremely high voltage, but also because they are often buried underground or are high overhead, making them hard to see and easy to forget about.
- Before conducting any work, survey the site for overhead powerlines. If you plan on digging, have all underground utilities located and marked before getting started.
- The best way to protect yourself from the danger of overhead power lines is to always maintain a safe distance between you and any energized power line.

- For power lines of 50,000 volts or less, keep at least 10 feet away.
- For lines over 50,000 volts, add another one-half inch of distance per 1,000 volts.
- The most reliable way to know the voltage of any power line is to contact the utility company that owns the line.
- It's also a good idea to use a spotter or install flagged warning lines to indicate the borders of the required power line clearance distances.
- The use of conductive tools or materials near power lines can be extremely dangerous and the full reach of any conductive object must be considered when adhering to the required power line clearance distances.
- Do not use metal ladders or conductive tools when working near any energized electrical parts.
- Be aware that electricity can arc through the air to a conductive object; you don't have to make contact to be electrocuted. Simply getting too close is more than enough to prove fatal.

A READING FROM THE OSHA FILES

Construction Worker Testimonial:

"We were constructing a chain link fence with 21-foot sections of metal top rail. One of our guys picked up one of those sections and held it up vertically. Unfortunately, the job was underneath an energized power line and when that section hit the line, it killed him instantly."

- The power lines over the work area should have been de-energized or otherwise rendered safe before the fence work was begun.
- Additionally, the employee hadn't received any training on the hazards of overhead power lines.
- Don't make this same mistake. Make it a point to be aware of any nearby power lines and make sure safe work practices are put into place before starting work.

ENERGIZED SOURCES

- There are two main hazards of working with energized sources: electrical shock and electrical burns.

Electrical Shock

- Electrical shock occurs when the person's body becomes part of the electrical circuit.
- This can happen when the worker comes into contact with both wires of an electrical circuit, the hot wire of an energized circuit and the ground or when a metallic part, such as a hand tool, has been energized.
- The effects of electrical shock can vary, from a faint tingle to electrocution and death. The severity of the shock depends on the amount of current that flows, its pathway through the body and the duration of exposure.
- When your skin is wet or moist with sweat, your body has much less resistance and more current will flow. Being wet increases the risk of being shocked as well as the amount of damage done.
- It only takes a small amount of current, about 25 milliamps, to stop your heart.

Electrical Burns

- Electrical burns occur when an electric current flows through the body's tissue or bone and generates enough heat to cause significant damage.
- Electrical burns and other damage due to current flow can be external as well as internal. This is why medical treatment should always be sought following any type of electric shock.
- Electrical-related burns can also be the result of an arc flash.
- To avoid electrical incidents, construction workers should stay out of electrical rooms and avoid opening any electrical equipment.
- Do not touch any open or uncovered electrical boxes, panels or breakers. Report this unsafe condition to your supervisor right away.
- Never perform electrical work if you are not a qualified electrical worker.

GROUND FAULT CIRCUIT INTERRUPTERS

- To protect yourself from electrical shocks and electrical burns, make sure the equipment you are using has a ground fault circuit interrupter, or GFCI.
- A GFCI is designed to detect ground faults and quickly interrupt the flow of the electrical current. It protects the worker by limiting the duration of an electrical shock.
- There are three types of GFCI's that you can find in the workplace:

1) A Receptacle GFCI: These are typically found in areas that have the potential for damp conditions to exist. A receptacle GFCI fits into a standard outlet box and protects workers from ground faults when a tool or plug is connected to the GFCI outlet.

2) A Temporary or Portable GFCI: Similarly, a portable GFCI is an extension cord combined with a GFCI. It adds flexibility in using receptacles that are not protected by GFCIs. This type of GFCI is often a mandatory requirement for use with extension cords on construction sites.

3) A Circuit Breaker GFCI: A GFCI circuit breaker controls an entire circuit on the main circuit board. This allows for a job site to have one GFCI per circuit, instead of having to install multiple GFCI outlets. This type of GFCI is usually installed in a panel box to give protection to selected circuits or work areas.

SAFETY PRECAUTIONS

- While GFCI's are extremely important for protecting workers from electrical shocks and electrical burns, you shouldn't rely on them as your only method of protection.
- You should also take the following precautions:
 - Avoid working on electrical equipment in damp or wet conditions;
 - Never allow metallic items or tools to make contact with energized electrical parts;
 - Follow appropriate lockout/tagout procedures to de-energize electrical equipment;
 - Wear the appropriate PPE, or personal protective equipment.
- For electrical workers, PPE may include voltage rated gloves and arc-rated clothing.
- Remember, only perform work on electrical circuit parts or equipment if you are both qualified and authorized to do so.

A READING FROM THE OSHA FILES

Construction Worker Testimonial:

“The maintenance guy was trying to correct electrical problems with two non-operational lamps. He must have assumed the power was off because he didn't test the wires or anything. He got electrocuted after he grabbed two live wires with his hand.”

- It doesn't matter how experienced or qualified you are, you can never let your guard down around electricity.

EXTENSION AND FLEXIBLE POWER CORDS

- Take a close look at any construction site and you'll probably notice multiple extension cords and other types of flexible power cords in use.
- Workers rely on extension and flexible cords to bring power to the tools they use to get the job done, but because they are so frequently used, these cords go through a lot of wear and tear.
- Electrocution hazards are created when the cords, plugs and grounding prongs become damaged.
- Damage occurs when cords get jammed in windows or doorways, when they get run over by mobile equipment traffic, abrasion from adjacent materials, improper use and storage and simply from excessive use over time.
- Occasionally, you may come across a three-pronged plug that is missing the ground pin. These cords should be immediately discarded or tagged and turned in to the supervisor.
- Remember, the ground prong is there to protect you from serious electrical hazards, including shocks and burns.
- It's important to understand that the power cord of double-insulated tools does not have a ground prong. This is because the outside frame of the tool is electrically insulated from contacting any internal energized parts.
- Double-insulated tools display a “square within a square” symbol.
- Always inspect extension cords and flexible power cords prior to each use. Check for loose or exposed wires. Make sure the insulation hasn't been damaged. Make sure the plug is fully intact.
- Never carry a tool by the cord.
- Never pull on a cord to disconnect it from the outlet.
- Keep cords away from heat, oil and sharp edges.
- Properly store and maintain your cords.
- Do not use extension and flexible cords in wet or damp conditions.
- For most workers, it is the handling and use of flexible power cords and extension cords that puts them at highest risk of electrocution. Always treat them with respect. It might save your life.

SUMMARY

- The electrocution hazards we have discussed such as those presented by power lines, energized sources and flexible power cords are part of OSHA's Fatal Four construction hazards that account for more than 60 percent of all construction-related injuries and fatalities.
- Don't become one of these statistics or stories. Stay alert on the job site and follow safe work practices to protect yourself from the electrocution hazards found on a construction job site.
- So, there you have it, OSHA's Fatal Four construction hazards. Use the information learned in this program, combined with your safety commitment, to make sure that you leave the jobsite each day the same way you arrived: safe, healthy and injury free.

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ANSWERS TO THE REVIEW QUIZ

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

ELECTRICAL HAZARDS: *One of Construction's Fatal Four*
REVIEW QUIZ

Name _____ Date _____

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

1. To maintain a safe distance from power lines of 50,000 volts or less, you should keep at least _____ away.
 - a. 3 feet
 - b. 5 feet
 - c. 10 feet

2. The most reliable way to know the voltage of any power line is to _____.
 - a. Count the number of disc insulators on the line
 - b. Contact the utility company that owns the line
 - c. Check the line with an approved multimeter

3. You must make contact with a conductive object to be electrocuted.
 - a. True
 - b. False

4. The severity of an electrical shock depends on _____.
 - a. The amount of current that flows
 - b. Its pathway through the body
 - c. The duration of exposure
 - d. All of the above
 - e. None of the above

5. It only takes about _____ of electric current to stop your heart.
 - a. 10 milliamps
 - b. 15 milliamps
 - c. 25 milliamps

6. Electrical burns and other damage due to current flow can be external as well as internal.
 - a. True
 - b. False

7. You should never perform electrical work if you are not a qualified electrical worker.
 - a. True
 - b. False

8. A ground fault circuit interrupter (GFCI) protects a worker by limiting the _____ of an electrical shock.
 - a. Amount of current
 - b. Pathway
 - c. Duration

9. A _____ is often a mandatory requirement for use with extension cords on construction sites.
 - a. Receptacle GFCI
 - b. Temporary or portable GFCI
 - c. Circuit breaker GFCI

10. Double-insulated tools will display a _____ symbol.
 - a. Triangle within a triangle
 - b. Circle within a circle
 - c. Square within a square

11. You should always inspect extension cords and flexible power cords before each use.
 - a. True
 - b. False