

ELECTROCUTION HAZARDS PART II: **EMPLOYER RESPONSIBILITIES IN CONSTRUCTION**

COURSE OUTLINE

- **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 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.

- **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.
- **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).
- **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.**

- **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.**
- **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" 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.**

- **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.
- **While guarding and isolation can reduce the hazards associated with the distribution of electricity on a job site, "lock-out/tag-out" 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 lock-out/tag-out 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.
- **Lock-out/tag-out 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.**

*** * * SUMMARY * * ***

- **Electrocution is one of the leading causes of death among construction workers, and electrical accidents result in thousands of job site injuries.**
- **To address these hazards, OSHA has established Electrical Safety Standards for Construction to help prevent electrical accidents, injuries and fatalities.**
- **The OSHA standards require construction employers to ensure that their worksites are free from recognized electrical hazards that are causing or are likely to cause death or serious physical harm.**
- **Employers must ensure that precautions are taken on each job site to reduce electrical hazards as much as possible.**
- **Implementing an Assured Equipment Grounding Conductor Program (AEGCP) or installing ground fault circuit interrupters (GFCIs) are both OSHA-approved safety approaches to keeping an "electrically safe" job site.**
- **Employees must be provided with the equipment and training in safe work practices that they need to avoid electrical hazards on the job. Now that you understand the electrical hazards that can be encountered on a job site, and the responsibilities that your employer has to protect you from those hazards, you can help ensure that you and your coworkers can go home safe at the end of every day**