

Electrical Safety

What this training will cover...

- ▶ Electrical hazards overview
- ▶ Electrical injuries
- ▶ Electrical fires
- ▶ Ground fault circuit interrupters
- ▶ Recognizing, evaluating, and controlling electrical hazards
- ▶ Personal Protective Equipment
- ▶ OSHA requirements

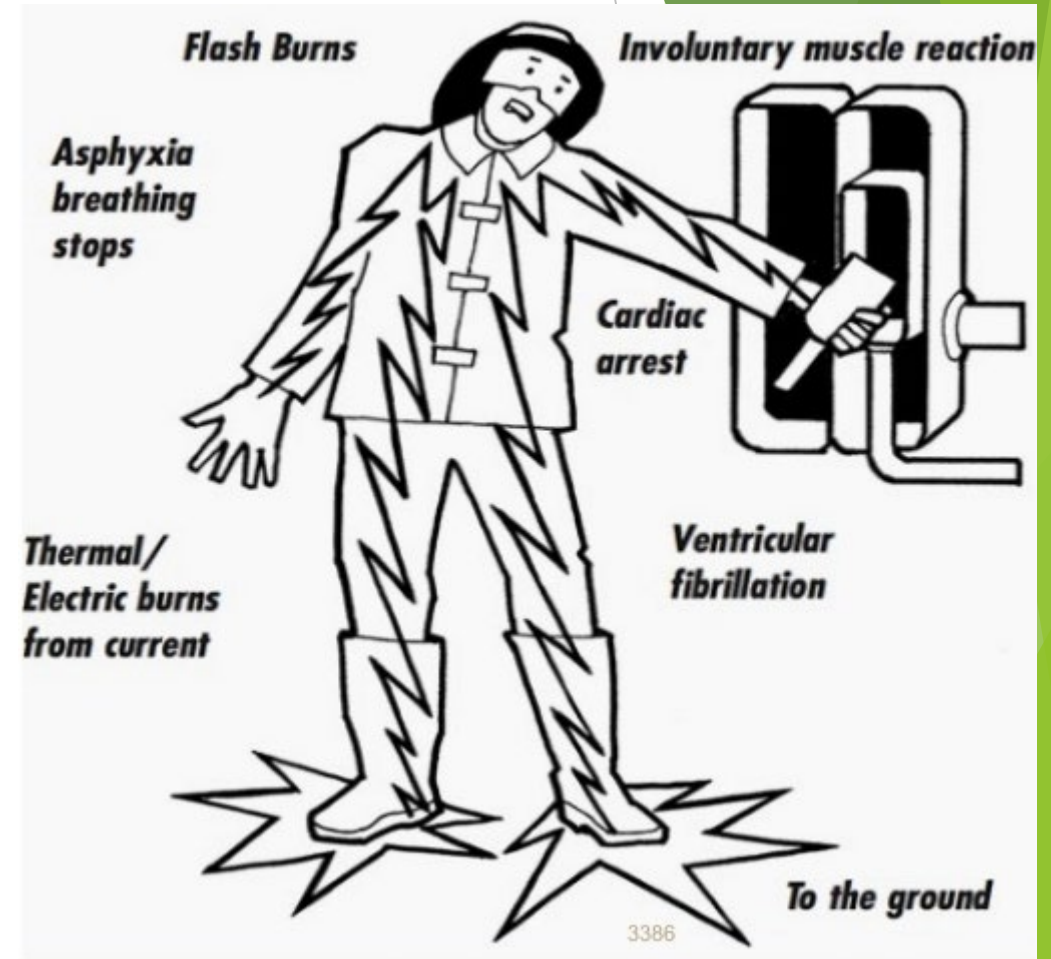


Overview

- ▶ While on the job, there are many potential sources of electrical hazards which include power tools, power lines, and electrical circuits
- ▶ Not only are Electricians exposed to electrical hazards, grounds people, maintenance people, and others in the vicinity of electrical hazards are frequently victims of electrical injuries
- ▶ Just because you are not working on electrical circuits does not mean you are safe from electrocution

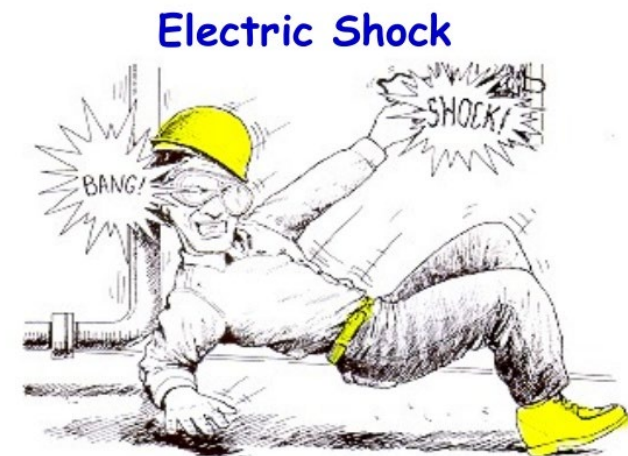
overview

- ▶ An electrical shock can be delivered any time an electrical current passes through the body
- ▶ This can happen through direct contact with an electrical circuit or arcing, as electricity passes through the air
- ▶ The injuries resulting from electrical shock range from minor burns to death



Electrical injuries

- ▶ Main types of electrical injuries
 - ▶ Electrical shock
 - ▶ Burns
 - ▶ Electrocution
 - ▶ Falls caused from shocks
- ▶ Severity of electrical injury depends on:
 - ▶ Amount of current
 - ▶ Length of time the current is passed through the body



Electrical injuries

- ▶ In addition to serious injury, defective or inappropriately used equipment can produce heat which can lead to electrical fires
- ▶ Electrical fires are one of the most common sources of fires and burns at home and in the workplace
- ▶ Small electrical fires can be extinguished by properly trained personnel using a fire extinguisher designed to put out Class C fires (all fire extinguishers are marked with the type of fire that particular extinguisher is designed to put out)



Ground fault circuit interrupter (Gfci)

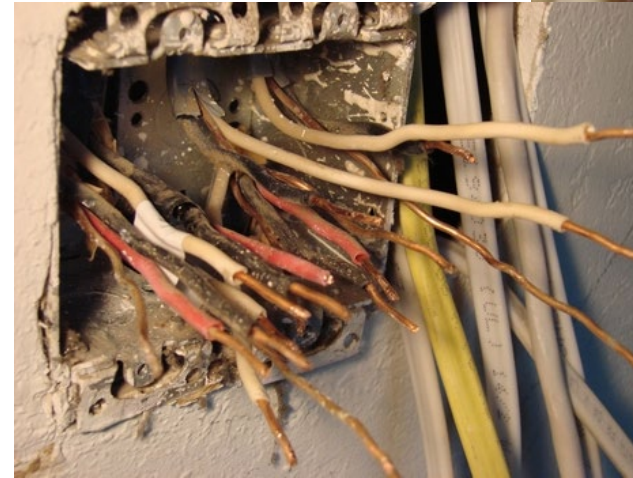
- ▶ Ground Fault Circuit Interrupter (GFCI) - device designed to prevent electrical shocks
 - ▶ It senses the difference between the current in the Supply and Return conductors
 - ▶ Under normal conditions, these currents are equal - however, if a problem develops with the device you are using, electrical current can flow from your hand, to your feet, to the ground
 - ▶ The GFCI senses that the current in the supply conductor does not equal the current in the return conductor because some of the current is flowing through your body
 - ▶ The GFCI will trip and cut off supply to prevent electrocution
 - ▶ A GFCI can sense 0.004 amp differences and trip in 0.033 seconds

Electrical hazards

- ▶ The best way to ensure electrical safety is to recognize, evaluate, and control hazards
- ▶ This involves planning for the job to be done and taking steps to reduce and remove any potential electrical hazards

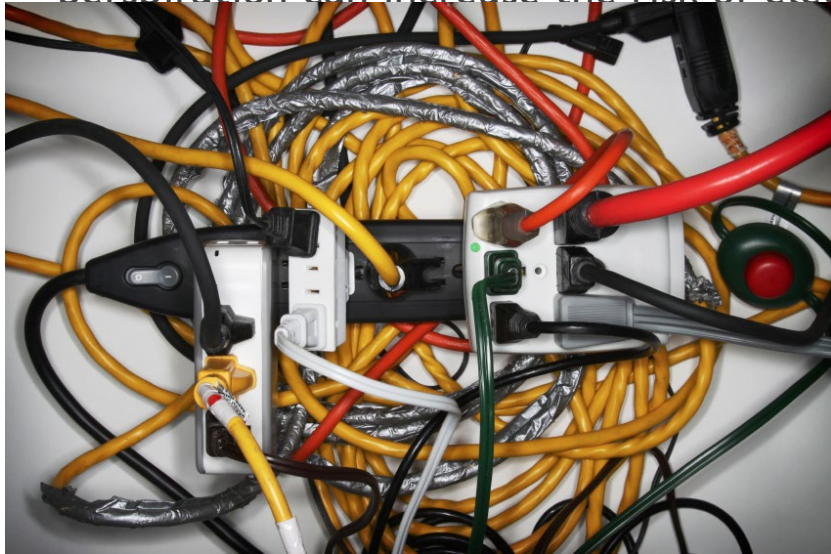
Identifying electrical hazards

- ▶ The first step is to recognize the electrical hazards you are about to face - you must know the situations that present danger!
 - ▶ Exposed electrical parts or bad insulation can allow current to be passed from the normal circuit path to your body or other conductive material
 - ▶ Power tools should be inspected before handling to ensure all electrical components are properly insulated
 - ▶ Overhead power lines can be dangerous when operating or moving large pieces of metal - most overhead lines are not insulated and can immediately conduct electricity
 - ▶ You should always maintain at least 10 feet of clearance from overhead lines or electrical lines



Identifying electrical hazards

- ▶ Overloaded circuits can create heat or cause arcing
 - ▶ It is possible that the circuit breaker will not trip and will not shut off the electrical current which can lead to fires or burns
- ▶ Wet conditions allow electricity to be conducted more easily, even through normally non-conductive material such as wood, leather, wet clothing, and even perspiration can increase the risk of electrical hazards



Evaluating electrical risks

- ▶ After recognizing that electrical hazards exist, the next step is to evaluate the risks
- ▶ For example, obviously, exposed electrical wiring is always a hazard, however when the exposed wiring is up on the ceiling out of the way or at ground level near chemicals, the risks are different

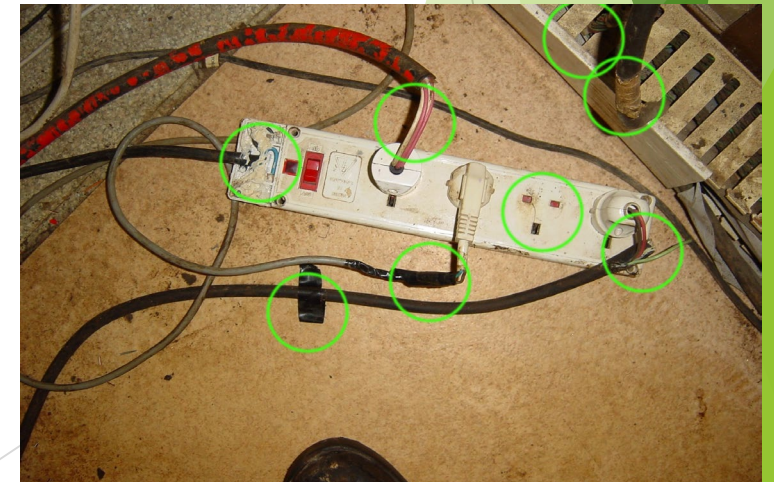
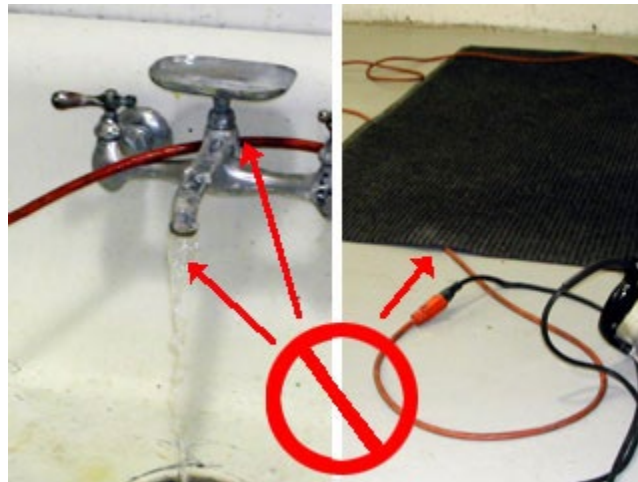
Identifying Electrical hazards

- ▶ The following are clues that undetected electrical hazards are present:
 - ▶ Tripped circuit breakers indicate too much current is flowing through a circuit
 - ▶ Power tools or extension cords that feel warm may indicate too much current flowing through the equipment
 - ▶ GFCI that trips indicates an imbalance in supply and return current
- ▶ If any of these are present, you must evaluate the cause of the situation



Removing electrical hazards

- ▶ After evaluating electrical hazards, you must take steps to reduce or remove the hazards
- ▶ DO NOT ignore signs of electrical hazards
- ▶ Sometimes taking corrective action might take longer than completing the actual job itself, but it is worth the time



Removing electrical hazards

- ▶ TIPS:
- ▶ Always test a circuit or wire before working on it to ensure it is de-energized
- ▶ Lock out and tag out all involved circuits and machines
- ▶ Prevent overloading a circuit or cord by using equipment with an appropriate rating
- ▶ Prevent electrical shocks by using GFCIs
- ▶ Work with another person (buddy system)
- ▶ DO NOT attempt any tasks for which you are not properly trained
- ▶ You should always wear appropriate PPE (personal protective equipment) for the job

PPE

- ▶ There are many types of PPE but only some can protect you from electrical hazards
 - ▶ Gloves can prevent electrical current from entering your body from accidental contact to exposed wiring or electrical parts - there are different types of gloves so be sure to choose the correct one for your job
 - ▶ Proper foot protection includes boots that are approved for electrical work - they should have an ANSI stamp of approval and be rated EH - however, an ANSI stamp alone does not guarantee electrical protection
 - ▶ Face shields help protect your face from flying objects or sparks
 - ▶ Hard hats protect your head from accidental bumps, falling objects
 - ▶ Remember to remove items like jewelry, watches, etc.



Osha regulations

- ▶ OSHA has published the following restrictions in regards to working on electrical equipment
 - ▶ “No employee will install, modify, or maintain any electrical device, unless they are qualified and authorized. This includes all electrical and control devices, lighting, computer network wiring installations, process control wiring at all levels, electrical alarm systems, heating, ventilating, and all wired communication systems.”



Electrical Safety

Electrical hazards can cause burns, shocks and electrocution (death).

Safety Tips

- Assume that all overhead wires are energized at lethal voltages. Never assume that a wire is safe to touch even if it is down or appears to be insulated.
- Never touch a fallen overhead power line. Call the electric utility company to report fallen electrical lines.
- Stay at least 10 feet (3 meters) away from overhead wires during cleanup and other activities. If working at heights or handling long objects, survey the area before starting work for the presence of overhead wires.
- If an overhead wire falls across your vehicle while you are driving, stay inside the vehicle and continue to drive away from the line. If the engine stalls, do not leave your vehicle. Warn people not to touch the vehicle or the wire. Call or ask someone to call the local electric utility company and emergency services.
- Never operate electrical equipment while you are standing in water.
- Never repair electrical cords or equipment unless qualified and authorized.
- Have a qualified electrician inspect electrical equipment that has gotten wet before energizing it.
- If working in damp locations, inspect electric cords and equipment to ensure that they are in good condition and free of defects, and use a ground-fault circuit interrupter (GFCI).
- Always use caution when working near electricity.



**ELECTRICAL
HAZARD**

Danger
High voltage

For more complete information:

OSHA Occupational
Safety and Health
Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3296-09A-05

Osha regulations

- ▶ According to OSHA, qualified persons must be trained in:
 - ▶ Skills and techniques necessary to identify exposed live parts of electric equipment
 - ▶ Skills and techniques necessary to determine the nominal voltage or exposed live parts

Osha regulations

- ▶ Electricians must be trained in:
 - ▶ National Electrical Code
 - ▶ National Electrical Safety Code
 - ▶ Facility's voltage distribution system
- ▶ If you do not meet these requirements, you are considered non-electrical personnel

Questions?

- ▶ Please contact Environmental Health & Safety (EHS)
- ▶ Stephanie Phillips steels@pfw.edu 260-481-4193
- ▶ Erin Turner mckie01@pfw.edu 260-481-4197