



SAFETY TOOLBOX TRAINING – AVOIDING ELECTRICAL SHOCKS

SUPERVISOR INSTRUCTIONS:

- Use toolbox trainings to spark safety discussions during monthly meetings with employees
- Submit the employee sign-in sheet to your designated administrative assistant /training coordinator as a record of training



A maintenance mechanic rode 12 feet above the floor on a motorized lift to work on a 277-volt light fixture. He did not turn off the power supply to the lights. He removed the line fuse from the black wire, which he thought was the "hot" wire. However, because of a mistake in installation, it turned out that the white wire was the "hot" wire - not the black one. The black wire was neutral. He began to strip the white wire using a wire stripper in his right hand. Electricity passed from the "hot" white wire to the stripper, then into his hand and through his body. A co-worker heard a noise and saw the victim lying face-up on the lift. She immediately summoned another worker, who lowered the platform. CPR was performed, but the maintenance mechanic could not be saved. He was pronounced dead at the scene. This death could have been prevented.

Whenever you work with power tools or on electrical circuits there is always a risk of electrical shock. Coming in contact with an electrical voltage can cause current to flow through the body, resulting in electrical shock, burns, or death. As a source of energy, electricity is used without much thought about the hazards it can cause. Since electricity is a familiar part of our lives, it often is not treated with enough caution. As a result, an average of one worker is electrocuted on the job every day of every year!

- Electrocution is the third leading cause of work-related deaths among 16- and 17-year-olds, after motor vehicle deaths and workplace homicide.
- Electrocution is the cause of 12% of all workplace deaths among young workers. Younger males die most often.
- New hires need to take the most care. 41% of all victims were on the job for less than 1 year.

How is an Electrical Shock Received?

An electrical shock is received when an electrical current passes through the body. The human body has a low resistance to electricity, making it a good conductor, like most metals. Unlike metals however, the human body does *not* respond well when electricity passes through it. Physical damage includes thermal burns, disruption of normal heart activity, severe muscle contractions, and death. Current will pass through the body in a variety of situations. Whenever two wires are at different voltages, current will pass between them if they are connected. Your body can connect the wires if you touch both of them at the same time. For example, in most household wiring, the black wires and the red wires are at 120 volts. The white wires are at 0 volts because they are connected to ground. If you come in contact with an energized black wire and you are also in contact with the neutral white wire, current will pass through your body and you will receive an electrical shock.



You can receive a shock even when you are not in contact with an electrical ground. Contact with both live wires of a 240-volt cable will deliver a shock. This type of shock can occur because one live wire

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may be at +120 volts while the other is at -120 volts during an alternating current cycle - a difference of 240 volts. You can also receive a shock from electrical components that are not grounded properly. Even contact with another person who is receiving an electrical shock may cause you to be shocked.

The most common and serious electrical injuries occur when electrical current flows between the hands and feet. The electrical energy is looking for the shortest path to the ground, and it will pass through the body to the feet to reach it. When this occurs, a person's heart and lungs are frequently damaged by the electrical energy. Placing an insulator between the energy and the point of physical contact is one method of protection. Porcelain, rubber, and dry wood offer substantial resistance to the flow of electricity, and are therefore good insulators. These materials can often protect a person from electrical shock.

How Do I Protect Myself from Electrical Shock?

Precautions for avoiding electrical shock include, but are not limited to, the following:

- Always make sure electrical tools are properly grounded or double insulated. The double insulated tool must have an undamaged outer case and be clearly labeled as "double insulated" by the manufacturer;
- Always check to be sure the grounding system is complete. Unless they are designated as double insulated, grounded power tools must be attached to a grounded service circuit. If there is *any* doubt about the grounding, test it!
- Use heavy duty grounded extension cords. These cords have two layers of insulation, with reinforcement between the layers. They are less susceptible to damage than house-hold type cords. To check if the cord is heavy duty, check its shape. Most *flat* cords are not heavy duty. Heavy duty cords will have a marking on the insulation such as: "S", "SJ", "SJO", etc.
- Avoid mixing water and electricity! Not only should you keep cords, tools, and working/walking surfaces dry, keep your hands and feet dry as well. The electrical resistance of wet skin is at least 100 times less than dry skin. Wet skin greatly increases the likelihood of severe shock if a person comes in contact with a live circuit. If you must work around water, connect to a Ground Fault Circuit Interrupter (GFCI) to automatically shut off the current if there is an abnormal current flow.
- Never work on or around a live electrical circuit. **Lock Out** the power so that *only you* have control over energizing the machine or equipment. Don't take chances.



What Should I do if a Co-Worker is Shocked or Burned by Electricity?

1. Shut off the electrical current if the victim is still in contact with the energized circuit. While you do this, have someone else call for help. If you cannot get to the switchgear quickly, pry the victim from the circuit with something that does not conduct electricity such as dry wood.



Do not touch the victim yourself if he or she is still in contact with an electrical circuit! You do not want to become a victim, too!

2. Do not leave the victim unless there is absolutely no other option. You should stay with the victim while Emergency Medical Services (EMS) is contacted. The caller should come back to you afterwards to verify that the call was made. If the victim is not breathing, does not have a heartbeat, or is badly injured, quick response by a team of emergency medical technicians (EMT's) or paramedics gives the best chance for survival.
3. Once you know that electrical current is no longer flowing through the victim, call out to the victim to see if he or she is conscious (awake). If the victim is conscious, tell the victim not to

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move. It is possible for a shock victim to be seriously injured but not realize it. Quickly examine the victim for signs of major bleeding. If there is a lot of bleeding, place a cloth (such as a handkerchief or bandanna) over the wound and apply pressure. If the wound is in an arm or leg and keeps bleeding a lot, gently elevate the injured area while keeping pressure on the wound. Keep the victim warm and talk to him or her until help arrives.

4. If the victim is unconscious, check for signs of breathing. While you do this, move the victim as little as possible. If the victim is not breathing, someone trained in CPR should begin artificial breathing, then check to see if the victim has a pulse. Quick action is essential! To be effective, CPR must be performed within 4 minutes of the shock.



If you are not trained in CPR or first aid, now is the time to get trained-before you find yourself in this situation! You also need to know the location of electricity shut-offs ("kill switches"), first-aid supplies, and telephones so you can find them quickly in an emergency.

QUESTIONS FOR DISCUSSION:

1. Are employees given and required to use the proper protective equipment and tools when working around electrical hazards?
2. Is there an effective lockout/tag out procedure for work on electrical circuits and equipment?
3. Have employees been advised of the location of hazards and proper protective measures to avoid contact with an energized circuit?
4. Are safe work practices (de-energizing live parts, discharging capacitors, lockout, etc.) used to prevent electrical shock and other injuries?
5. Are portable electrical tools and equipment grounded or double insulated?
6. Do electrical boxes and fittings have approved covers?
7. Are defective, damaged, or frayed electrical cords replaced promptly?

REMEMBER: HINDSIGHT EXPLAINS THE INJURY THAT FORESIGHT WOULD HAVE PREVENTED