

Electrical Safety

Goal

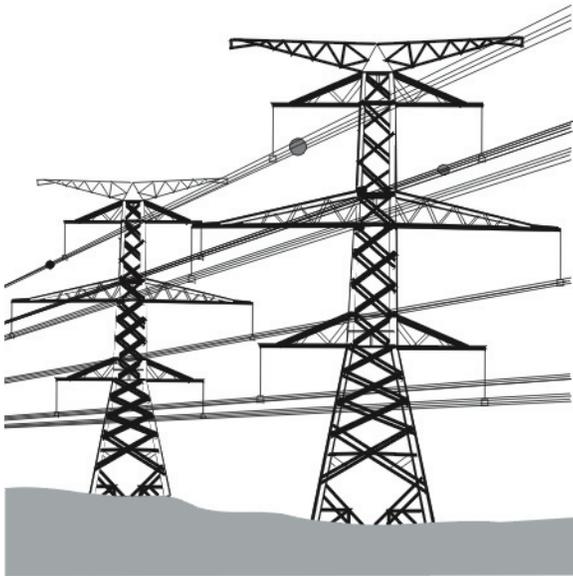
Improve hazard recognition and emphasize the importance of following proper electrical safety procedures.

Objective

Workers will be able to identify and maintain safe conditions in the workplace to avoid electrical hazards.

Background

Electricity is such a common part of life that it is easy to forget the dangers associated with its use. This lack of respect for the dangers of electricity results in a high number of electrocution deaths both in the workplace and at home. Shocks severe enough to kill occur when electric current travels through the body, especially when near the heart.



Electric shock can also cause:

- severe pain;
- damage to nerves, muscles, or tissues;
- internal bleeding;
- loss of muscle control and coordination; and
- cardiac arrest.

Electric shock can be avoided by following safety procedures.

Hazards

Electricity always flows along the path of least resistance. The human body poses little resistance to electric current because of its high water and electrolyte content. The following conditions take advantage of the body's good conductive properties and may cause electrocution:

- contact with wires not properly insulated;
- direct contact with electrical conductors such as power lines; and
- touching an electrically charged appliance with wet hands or while standing in water.

Electric current flowing through the body can cause serious internal or external burns. Severe external thermal burns often result from direct contact with equipment overheated by electrical current. Overloaded circuits or equipment may cause fires or explosions, especially if they occur in areas where flammable or explosive substances are stored.

Regulations

The *General Industry Code of Federal Regulations* (CFR) 29 CFR 1910.301-399, contains electrical safety regulations involving the design of electrical installations. The detailed *Electrical Safety-Related Work Practices Standards* (29 CFR 1910.331-360) limits certain tasks to "qualified" employees. Qualified is defined as "those persons having training in avoiding the electrical hazards of working in or near exposed energized parts". Qualified employees must be able to distinguish exposed live electrical parts and their nominal voltage, as well as the clearance distances and corresponding voltages to which they will be exposed.

Unqualified workers exposed to overhead electrical lines, are required to maintain a minimum distance of ten feet from any unguarded equipment. Vehicles and mechanical equipment must also maintain this distance.

Procedures

Creating a safe work environment includes safe work practices and identifying common hazards. The following procedures provide an effective way of reducing electrical accidents:

- use lockout/tagout procedures before working on electrical circuits and equipment;
- avoid working around electrical sources when you, your surroundings, tools, or clothing are wet;
- keep a towel or rag handy for drying your hands;

- stop outdoor electrical work when it begins to rain;
- ventilate the work area to reduce atmospheric hazards like dust, flammable vapors, or excess oxygen;
- maintain a clean and orderly, hazard-free environment;
- arrange tools and equipment neatly, returning everything to its proper place after each use;
- keep the work area free of rags, trash, and other debris;
- clean up spills promptly, and keep floors completely dry;
- use waterproof cords outdoors;
- be sure all extension cords have their three-pronged plugs intact;
- secure all electrical cords when used in or around walkways;
- avoid using electrical cords near heat, water, and flammable or explosive materials; and
- never use an extension cord with damaged insulation.

Safe Operation

Power tools must meet National Electric Code (NEC) standards for double-insulated casings or third-wire power cord grounding. Hand tools should also have factory installed insulated grips.

Follow these suggestions when using electrical tools:

- inspect tools for wear or defects before starting the job;
- check tools to be sure all safety guards or shields are in place;
- never modify tools or electrical equipment;
- inspect power cords and switches for cuts, frayed insulation, exposed terminals and loose connections;
- make sure tools are clean, dry, and free of oily film or carbon deposits;
- do not carry, store, or hang up a power tool by the power cord;
- stop using tools immediately if they begin to smoke, spark, or shock;
- do not overload wall plugs or extension cords;
- make sure the extension cord is the right size or rating for the tool being used; and
- never remove the grounding post from a three-pronged plug to make it fit into a two-pronged wall socket.

Clothing & Personal Protective Equipment

Wear comfortable and practical clothes for the job.

- wear a good pair of oil-resistant safety shoes with nonskid soles and heels;
- do not wear clothes that restrict movement;

- wear cotton or fire resistant clothing;
- avoid loose clothing which might get caught in equipment;
- do button shirt cuffs;
- remove neckties, jewelry, scarves, and wrist watches;
- secure long hair in a hat or hair net;
- use Class B protective hats when working around overhead electrical lines;
- avoid belts with large metal buckles;
- when wearing a tool belt do not allow tools to hang out of their holders or dangle from the belt; and
- remove the tool belt before working in tight spaces.

The following personal protective equipment (PPE) is recommended to prevent your body from becoming an electrical conductor:

- nonconductive head, eye and face protection;
- rubber gloves and clothing; and
- rubber-soled boots or shoes.

All PPE must fit properly, and be cleaned and properly stored when not in use. All electrical protective equipment and devices must be tested for functional soundness at regular intervals, as specified by 29 CFR 1910.137.



First Aid

Follow these procedures in case of an electrical accident:

- do not touch the victim;
- call for immediate, professional medical help;
- turn off the power if it can be done safely;
- use a dry pole (or anything that does not conduct electricity) to push the person away from the electrical source;
- once the victim is separated from the power source, treat them for shock and cover them lightly, until help arrives;
- administer artificial respiration if breathing has stopped;
- administer CPR if the heart has stopped; and
- cover electrical burns with a clean, dry cloth.

For electrical fires:

- notify the local fire department or call 911 immediately;
- do not touch the burning object;
- do not use water on an electrical fire;
- use a “C class” fire extinguisher such as carbon dioxide or a multipurpose ABC extinguisher to put out small fires; and
- stay clear of the area and wait for the professionals unless you are qualified to fight this kind of fire.

Summary

Working on energized electrical systems can present a hazard to the unqualified worker. By following the procedures outlined above, many accidents and injuries may be avoided.

Review

1. According to OSHA, what is a “qualified” employee?
 - a. an individual who is a licensed journeyman or master electrician
 - b. an individual who knows how to properly use electrical testing equipment and PPE
 - c. an individual who has training in avoiding the electrical hazards of working on or near exposed energized parts
 - d. a licensed electrical contractor
2. What precautions should be taken before using electrical equipment?
 - a. inspecting electrical tools before use for visible damage or defects
 - b. ventilating the work area to eliminate a potentially explosive atmosphere
 - c. using lockout/tagout procedures on all affected electrical components
 - d. all of the above
3. The steps that should be taken when an electrical accident occurs are _____?
 - a. call for emergency response help, apply wet compresses to burned skin, keep the victim mobile, and turn off power
 - b. call for emergency response help, pull victim off of electrical source, give CPR, and secure the scene of the accident
 - c. call for emergency response help, turn off power, push victim off electrical source using a nonconductive stick, and give first aid as needed
 - d. none of the above
4. What are the environmental conditions that promote electric shock?
 - a. dry hands, dusty surroundings, using defective electrical equipment, and failure to follow electrical safety workplace practices
 - b. using defective electrical equipment, wet hands, failure to follow electrical safety workplace practices, and wet surroundings

- c. wet hands, insulated hand tools, using repaired electrical equipment, and wet surroundings
- d. dry surroundings, dry skin, using defective electrical equipment, and failure to follow electrical safety workplace practices, and wet surroundings

5. The three causes of electrical accidents are _____?
 - a. defective PPE, contact with improperly insulated wires, and indirect contact with electrical conductors
 - b. touching an electrically charged appliance with dry hands, contact with improperly insulated wires, and indirect contact with electrical conductors
 - c. failure to observe proper safety procedures, defective PPE, and direct contact with electrical conductors
 - d. touching an electrically charged appliance with wet hands, contact with improperly insulated wires, and direct contact with electrical conductors

Answers

1. c
2. d
3. c
4. b
5. d

Resources

The Texas Department of Insurance, Division of Workers' Compensation (TDI/DWC) Resource Center offers a workers' health and safety video tape library. Call (512) 804-4620 for more information or visit our web site at www.twcc.state.tx.us.
Disclaimer: Information contained in this training program is considered accurate at time of publication.