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Be aware of electrical hazards

Electricity is a source of potential harm in every workplace. Some of us become so accustomed to using electrical devices without incident, however, that we often overlook its hazards. Many others are completely unaware of the dangers present in their work environment, which makes them even more vulnerable.

There are four main types of electrical injuries: Electrocution (fatal), electric shock, burns and falls caused as a result of contact with electrical energy.

Electricity flows easier through some materials than others. Some, such as metals, generally offer very little resistance to the flow of electric current and are called conductors.

Glass, plastic, porcelain, clay, pottery, dry wood and similar substances generally slow or stop the flow of electricity. They are called insulators.

Electricity travels in closed circuits, normally through a conductor, and sometimes a person's body — an efficient conductor of electricity — becomes part of the electric circuit. This can cause an electrical shock. Shocks occur when a person's body completes the current path with:

- Both wires of an electric circuit.
- One wire of an energized circuit and the ground.
- A metal part that accidentally becomes energized due, for example, to a break in its insulation.
- Another conductor carrying a current.

Electric shock can result in anything from a slight tingling sensation to immediate cardiac arrest. The severity depends on the amount of current flowing through the body, the current's path through the body, the length of time the body remains in the circuit and the current's frequency.

Burns are the most common shock-related injury.

Electrical burns are among the most serious and require immediate medical attention. They occur when electric current flows through tissues or bone, generating heat that causes tissue damage.

Arc or flash burns result from high temperatures caused by an electric arc or explosion near the body. These burns should be treated promptly.

Thermal contact burns are caused when the skin touches hot surfaces of overheated electric conductors, conduits, or other energized equipment. Thermal burns also can be caused when clothing catches on fire, as may occur when an electric arc is produced.

Static electricity also can cause a shock, though in a different way. It can build up on the surface of an object and, under the right conditions, can discharge to a person.

It also can discharge to an object with much more serious consequences, as when friction causes a high level to build up at a specific spot on an object. This can happen simply through handling plastic pipes and materials or during normal operation of rubberized drive or machine belts found in many worksites. If static electricity discharges with a large enough spark near flammable or combustible substances, an explosion can result.

Here are some general safety tips for working with or near electricity:

- Inspect tools, power cords and electrical fittings for damage or wear prior to each use. Repair or replace damaged equipment immediately.
- Always tape cords to walls or floors when necessary. Nails and staples can damage cords causing fire and shock hazards.
- Use cords or equipment rated for the level of amperage or wattage you are using.
- Always use the correct size fuse. Replacing a fuse with one of a larger size can cause excessive currents in the wiring and possibly start a fire.
- Unusually warm or hot outlets may be a sign that unsafe wiring conditions exists. Unplug any cords to these outlets and do not use until a qualified electrician has checked the wiring.
- Always use ladders made of wood or other non-conductive materials when working with or near electricity.
- Place halogen lights away from combustible materials such as cloths or curtains. Halogen lamps can become very hot and may be a fire hazard.
- Risk of electric shock is greater in areas that are wet or damp. Install Ground Fault Circuit Interrupters (GFCIs) as they will interrupt the electrical circuit before a current sufficient to cause death or serious injury occurs.

The Quiz

These questions are meant to help you remember what was discussed today — not to test your patience or challenge your intelligence. The answers are at the bottom of the page. Cover them up, and complete the quiz as quickly as you can.

1. Taking electricity for granted can lead to serious accidents.
   TRUE ____ FALSE ____

2. Are falls among the main types of electrical injuries?
   YES ____ NO ____

3. Shocks occur when a person's body completes the current path with:
   A. Both wires of an electric circuit.
   B. One wire of an energized circuit and the ground.
   C. A metal part that accidentally becomes energized.
   D. Another conductor carrying a current.
   E. All of the above.

4. Burns are the most common shock-related injury.
   TRUE ____ FALSE ____

5. Thermal burns are caused:
   A. An electric arc.
   B. When electric current flows through tissue or bone.
   C. When skin touches the surface of overheated electric conductors, conduits or other energized equipment.

6. Can static electricity cause a fire or an explosion?
   YES ____ NO ____

7. Which of these are among safe ways to work with or near electricity:
   A. Use staples or nails, not tape, to attach cords to walls.
   B. Always use the correct size of fuse.
   C. Always use ladders made of wood or other non-conductive material.
   D. Make sure ground fault circuit interrupters are installed if work is being done in wet or damp areas.

8. Are there enough electrical outlets in your workplace to safely accommodate all the electrical devices being used?
   YES ____ NO ____ DON'T KNOW____

ANSWERS: 1. True, 2. Yes, 3. E., 4. True, 5. C., 6. Yes, 7. B., C., D., 8. Your answer

Hold These Thoughts

When a person receives an electrical shock, sometimes the electrical stimulation causes the muscles to contract. This "freezing" effect makes the person unable to pull free of the circuit. It is extremely dangerous because it increases the length of exposure to electricity and because the current causes blisters, which reduce the body's resistance and increases the current.

The longer the exposure, the greater the risk of serious injury. Longer exposures at even relatively low voltages can be just as dangerous as short exposures at higher voltages. Low voltage does not imply low hazard.

In addition to muscle contractions that cause "freezing," electrical shocks can cause involuntary muscle reactions. These so-called startle reactions can result in a wide range of other injuries from collisions or falls, including bruises, bone fractures, and even death.

If a person is "frozen" to a live electrical contact, shut off the current immediately. If this is not possible, use boards, poles, or sticks made of wood or any other non-conducting materials and safely push or pull the person away from the contact. It's important to act quickly, but remember to protect yourself as well from electrocution or shock.

It is also important to remember that a severe shock can cause considerably more damage than meets the eye. A victim may suffer internal hemorrhages and destruction of tissues, nerves, and muscles that aren't readily visible. Renal damage also can occur.
If you or a coworker receives a shock, seek emergency medical help immediately.

For the Record

Date of Meeting: _____
Location: _____
Start Time: _____ Finish Time: _____

Topic: _____
Department:_____
Meeting Leader: _____

In Attendance:

It really happened...

Electricians were repairing and cleaning insulators at an outdoor electrical substation. They first followed written group lockout procedures to de-energize and lock out the half of the substation where work was to be done. However, a nearby 13,800-volt busbar was still energized because it was not apparent that the other half of the substation supplied this conductor. An electrician contacted the energized busbar as he was climbing down a supporting column and fell more than nine feet (three meters) onto concrete. He suffered fatal internal injuries.

An investigation revealed that the written lockout procedure did not include isolation of all energy sources. There was no visual check of the physical plant to verify that all electrical equipment and sources of energy were identified in the lockout procedure.

This incident illustrates the need to follow these safe work practices:

- Include all sources of energy in written lockout procedures.
- When lockout procedures are developed, do a physical check to ensure that every piece of equipment and all sources of energy are identified.
- Ensure electrical line diagrams are accurate and reflect the location of electrical conductors.
- Undertake physical testing to ensure grounding and isolation are effective.
- Hold a pre-job safety meeting before starting work on high-voltage equipment.