

**ESH 377**

**ELECTRICAL SAFETY AWARENESS**

## INTRODUCTION:

---

- **An average of one co-worker is electrocuted on the job every day of every year**
- **Electrocution is the third leading cause of work-related deaths among 16-17 year olds, after motor vehicle deaths and workplace homicide**
- **Electrocution is the cause of 12% of all workplace deaths among workers**
- **Low voltage does not mean low hazards**

Every year electrical accidents cause thousands of injuries and hundreds of deaths. Unsafe conditions at home and work and unsafe acts are the causes of these accidents. By learning to spot and prevent electrical hazards, you'll make your home and workplace safer.

## PURPOSE STATEMENT:

---

This course will improve your awareness of electrical hazards and provide basic information on working safely around electricity and electrical systems.

This training is not a substitute for more detailed and hands-on training provided to employees who work on or with electrical devices. This training does not qualify you to be an electrical worker.

## LEARNING OBJECTIVES:

---

**In this course you will learn about electrical hazards and electrical safety.**

- **What is electricity?**
- **How can it hurt me?**
- **How can I protect myself?**
- **What am I allowed to do?**
- **What should I do in an electrical emergency?**
- **Where can I find ANL electrical safety requirements?**

## ABOUT ELECTRICITY:

---

Electricity is electric current (the flow of electrons) used as a source of power. This current always follows a pathway. As designated, the pathway is wires and cords, however, your body can become a pathway too. This results in electrical shock. The severity and effects of an electrical shock depend on a number of factors, including the **pathway through the body**, the amount of current, the length of time of the exposure, and whether the skin is wet or dry.

Water is a conductor of electricity, allowing current to flow more easily in wet conditions and through wet skin. The effect of an electrical shock may range from a slight tingle to severe burns to cardiac arrest.

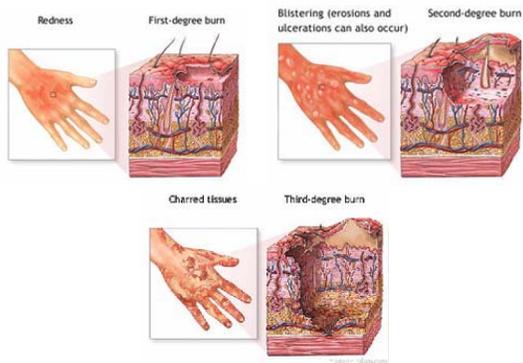
## HAZARDS ASSOCIATED WITH ELECTRICAL EQUIPMENT:

---

### SHOCK:

Electric shock is the involuntary response to the passage of electric current. The greater the flow of current, the more serious the shock and resulting reaction will be. Electric shock occurs when the body (a fairly efficient conductor) becomes part of the electric circuit. The current enters the body at one point and leaves at another. The result of electric shock includes any of the following: cardiac arrest; involuntary muscle contraction; kidney damage; internal hemorrhages, and destruction of tissues, nerves and muscles. An electric shock that results in death is known as electrocution.





## BURNS:

The most common shock-related injury is a burn. Burns suffered in electrical incidents can be divided into three types: electrical burns, arc burns, and thermal contact burns. All three types of burns may be produced simultaneously. High voltage contact burns can burn internal tissues while leaving only very small injuries on the outside of the skin. Burns suffered in electrical accidents may affect the skin, muscles, and bone.

## ARC FLASHES:

Arc or flash burns result from high temperatures caused by an electric arc or explosion near the body. These burns should be treated promptly. Arc flashes are extremely harmful and are potentially fatal. In fact, arc flashes cause more deaths than electrocution to electrical workers.



## PROTECTING YOURSELF FROM ELECTRICAL HAZARDS:

---

### AVOID HAZARDS:

1. Signs      Signs - Observe all signs and follow posted instructions. Do not enter "High Voltage" areas unless you are QUALIFIED and AUTHORIZED to do so.
2. Posting    Posting - If you do not understand what a sign or posting is saying, do not proceed. Ask your supervisor.
3. Barriers    Barriers - Barriers such as fences and equipment cases are there to prevent you from contacting hazardous electrical equipment. Do not attempt to enter fenced areas or disable equipment guards.

4. Clear Distance "Clear" distance - The most common unsafe acts include using tools or equipment too close to energized parts. Keep clear of energized parts. Be aware of the conductive materials and tools around you, and keep them far from sources of electricity. Remember, steel wool, metallic cleaning cloths, and some chemicals are conductive. The Argonne overhead electrical wire clearance distance is 10 feet, and the typical distance from other exposed electrical devices varies from 3 to 10 feet.
5. Wet Work Areas Wet/Moist work areas - Environments containing wet or damp locations can be particularly dangerous when electrical equipment is in use. Don't use electrical equipment when your hands are wet or any part of you is touching water. If you must work in damp areas, use a Ground Fault Circuit Interrupter (GFCI). Remember, it's best to keep water and electricity far apart.
6. Listing Listing - Workers must be protected against potential electrical equipment hazards. In most cases, hazards can be reduced by using Underwriters Laboratory (U/L) or Nationally Recognized Testing Laboratory (NRTL) listed equipment, installing sufficient capacity, providing well-located receptacles, and arranging cords and outlets to avoid tripping hazards. Poorly maintained, unsafe, poor quality, and/or non-listed electrical equipment can present potential electrical hazards.
7. Housekeeping Housekeeping - Good housekeeping is paramount to the prevention of electrical hazards. Cords must be placed so that they are not damaged or cause tripping hazards.

#### **INSPECTION:**

Before use, inspect all electrical equipment and electrical outlets. Check cords, plugs and outlets for defects. Use only equipment that is in good condition. Never use equipment that you know is damaged, because no shortcut is worth electrical shock. Power operated hand tools such as drills and saws must be inspected and checked by your division for electrical safety regularly. Special equipment and equipment imported from a foreign country might be rated for

different voltage and have a different style of plug. If a piece of equipment does not readily plug into the available outlet, do not force it or modify the plug. Contact your building manager or supervisor for assistance.

### **REPORT DAMAGE:**

If you identify damaged equipment or power cord, do not use it. Put a tag, note or sign on the equipment and report the damage to your supervisor. Damaged equipment must be removed from service and be repaired or discarded.

## **WHAT ARE YOU: QUALIFIED OR UNQUALIFIED?**

---

### **UN QUALIFIED:**

Unqualified persons are only permitted to:

- Plug and unplug office equipment, appliances, scientific, and similar equipment to/from standard receptacles
- Replace batteries in calculators, flashlights, and similar equipment

Any other work involving electrical equipment or devices requires a qualified person.



### **QUALIFIED:**

Qualified persons require specific electrical safety and hands-on training and must be authorized by their division director as "qualified" to do specific tasks within the division. If you are not trained and authorized, you are not qualified.



## **EMERGENCY RESPONSE: ELECTRICAL ACCIDENTS**

---

### **IF AN ELECTRICAL ACCIDENT HAPPENS...Don't become the next victim!**

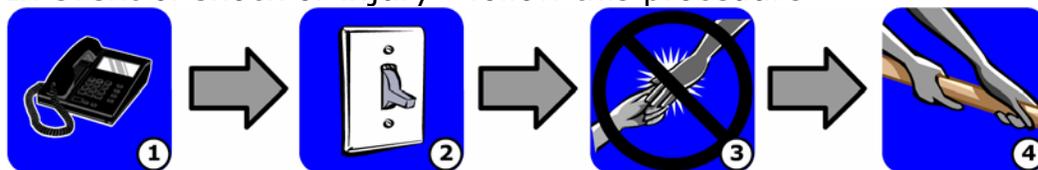
If you are the first person on the scene of an electrical accident, use extreme caution. There may still be live electrical equipment in the area and the area around the victim may be hazardous. Don't become

the next victim. Before you do anything else, call for trained emergency help. If there are any questions on how to respond to shock injuries and electrical fires, view the diagrams below for specific safety procedures. Remember, even if a shock victim is conscious and appears to be unharmed, they must have medical care.

**Everyone exposed to electrical hazards should be aware that even shocks from "low" voltage circuits can be fatal, and that prompt emergency medical care can be lifesaving.**

### SHOCK/INJURY:

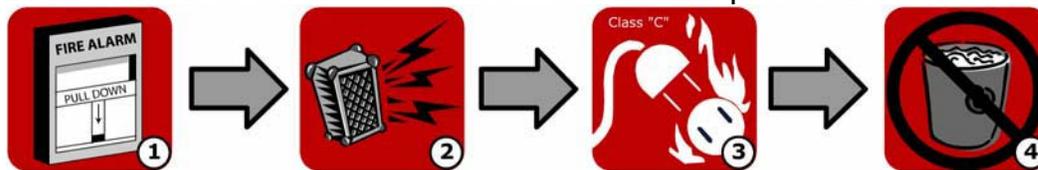
In event of shock or injury - follow this procedure



1. Dial 911 immediately.
2. If a person is being shocked, if possible, turn off the source of electricity.
3. Do Not Touch someone who is being shocked.
4. Remove the person away from the electrical source using non-conductive material.

### ELECTRICAL FIRE:

In the event of an electrical fire – follow this procedure



1. Activate the fire alarm by operating the manual pull station at the exit or dial 911.
2. Alert everyone in the immediate area to evacuate.
3. Use only a Class C fire extinguisher on an electrical fire. Do not use an extinguisher unless it is safe to do so.
4. NEVER USE WATER ON AN ELECTRICAL FIRE!

## CONCLUSION:

---

### **Electrical Safety - Working Sensibly With Electricity**

Electrical accidents cause thousands of injuries and hundreds of deaths every year. Unsafe conditions at home and work and unsafe acts are the causes of these accidents. By learning to spot, correct and prevent these electrical hazards, you'll make your home and workplace safer.

### **REMEMBER! Safety is a group effort**

Argonne has trained staff available to help you when identifying hazards, assessing risks and applying control measures. Discussing safety procedures with your supervisor and safety coordinator and using their experience and expertise of trained and qualified staff will ensure a safer outcome for everyone.