



Electrical Safety

Health Worker Safety Training Module 6

Topics

- Introduction
- Key definitions
- Causes of electric shock
- Dangers of electric shock
- Electrical burns
- The Electrical Safety Model

Introduction

- Whenever working with power tools or on electrical circuits, there is a risk of electrical hazards—especially electrical shock.
- Health workers are exposed to more hazards because job sites can be cluttered with tools and materials, fast-paced, and open to the weather.
- Risk is also higher at work because many jobs involve electric power tools.
- Contact with electrical voltage can cause current to flow through the body, resulting in electrical shock and burns.
- Serious injury or even death may occur.



Key Definitions

Key Definitions

Voltage

- Voltage is a measure of the electrical force that pushes the current along.
- The symbol for voltage is "V".

Key Definitions

Amperage

- Amperage is the unit used to measure the amount of electrical current.
- Amperage is often referred to as "current" by electrical workers and engineers.
- The symbol for amperage is "I".

Key Definitions

Resistance

- Resistance is the unit (ohms) used to measure the opposition to the flow of electrical current.
- In an electrical circuit, components are usually sources of resistance. Any component that heats up due to electrical current is a source of resistance.
- The symbol for resistance is "R".



Causes of Electric Shock

Electrical Wiring

- In most wiring in Tanzania, the black wires and the red wires are at 240 volts.
- The white wires are at 0 volts because they are connected to ground.
- The connection to the ground is often through a conducting ground rod driven into the earth. The connection can also be made through a buried metal water pipe.
- If you come in contact with an energized black wire-and you are also in contact with the neutral white wire a current will pass through your body. You will receive an electrical shock.

How do you receive an electrical shock?

An electrical shock is received when electrical current passes through the body.

1. Contact with both live wires of a 240-volt cable
2. Improperly grounded electrical components
3. Contact with another person who is receiving a shock





The Dangers of Electrical Shock

Severity of Electrical Shock

- The severity of injury from electrical shock depends on:
 - Amount of electrical amperage (current)—higher voltage creates greater current
 - Length of time the current passes through the body
 - Pathway of the current



Effects of Electric Shock

- Severity of injury from electric shock can range depending on the current and duration of the shock
- Effects of shock can include:
 - slight tingling sensation
 - severe muscle contractions
 - burns
 - internal damage or bleeding
 - cardiac arrest
 - death

Effects of Electrical Current on the Body

Current	Reaction
1 milliamp	Just a faint tingle.
5 milliamps	Slight shock felt. Disturbing, but not painful. Most people can "let go." However, strong involuntary movements can cause injuries.
6-25 milliamps (women)†	Painful shock. Muscular control is lost. This is the range where "freezing currents" start. It may not be possible to "let go."
9-30 milliamps (men)	
50-150 milliamps	Extremely painful shock, respiratory arrest (breathing stops), severe muscle contractions. Flexor muscles may cause holding on; extensor muscles may cause intense pushing away. Death is possible.

Effects of Electrical Current on the Body (continued)

Current	Reaction
1,000-4,300 milliamps (1-4.3 amps)	Ventricular fibrillation (heart pumping action not rhythmic) occurs. Muscles contract; nerve damage occurs. Death is likely.
10,000 milliamps (10 amps)	Cardiac arrest and severe burns occur. Death is probable.
15,000 milliamps (15 amps)	Lowest over-current at which a typical fuse or circuit breaker opens a circuit!

*Effects are for voltages less than about 600 volts. Higher voltages also cause severe burns.

†Differences in muscle and fat content affect the severity of shock.



Electrical Burns

Electrical Burns

- The most common shock-related, non-fatal injury is a burn.
- Burns caused by electricity may be of three types:
 1. electrical burns
 2. arc burns
 3. thermal contact burns
- Electrical burns can result when a person touches poorly maintained electrical wiring or equipment
- Electrical burns are among the most serious injuries you can receive. They require immediate medical attention.

What To Do if a Co-Worker is Shocked or Burned by Electricity:

- Shut off the electrical current if the victim is still in contact with the energized circuit.
- Have someone else call for help. If you cannot get to the switchgear quickly, pry the victim from the circuit with something non-conductive, such as a dry wood or plastic pole.
- Stay with the victim while medical help is alerted.
- Keep the victim warm and talk to them until help arrives



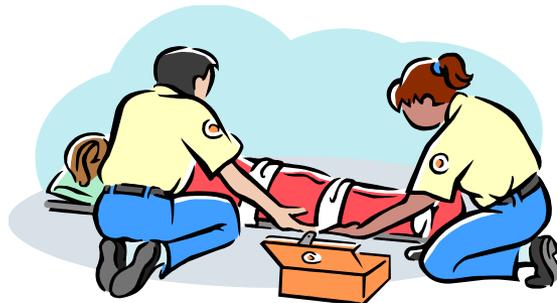
Do not touch the victim yourself if he or she is still in contact with an electrical circuit or you will be shocked!

What To Do if a Co-Worker is Shocked or Burned by Electricity (continued):

- If the victim is bleeding, place a cloth over the wound and apply pressure.
- 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.



To be effective, CPR must be performed within 4 minutes of the shock.



What You Should Know To Be Prepared for an Electrical Emergency

- ✓ Training in CPR and first aid
- ✓ Location of the electricity shut-offs
- ✓ Location of the first aid supplies
- ✓ Location of the nearest telephone





Electrical Fires

Extinguishing Electrical Fires

- Electricity is one of the most common causes of fires and thermal burns in homes and workplaces.
- Defective or misused electrical equipment is a major cause of electrical fires.
- All fire extinguishers are marked with letters that tell you the kinds of fires they can put out.
 - If there is a small electrical fire, be sure to use only a Class C or multipurpose (ABC) fire extinguisher, or you might make the problem worse.
 - Some extinguishers also contain symbols



Fire Extinguisher Symbols

	A (think: Ashes) = paper, wood, etc.
	B (think: Barrel) = flammable liquids
	C (think: Circuits) = electrical fires

Extinguishing Electrical Fires



Do not try to put out fires unless you have been properly trained

If you are not trained, the best thing you can do is evacuate the area and call for help.



The Electrical Safety model

The Electrical Safety model

Recognize Hazards

- Identify all possible hazards and discuss with co-workers
- Plan safety procedures with co-workers

Evaluate Risk

- Evaluate the potential risk of every workplace hazard
- Remember that workplaces constantly change and hazards should be constantly evaluated

Control Hazards

- Create a safe work environment by using safe practices
- Report hazards to supervisors

Recognizing Electrical Hazards

- Poor wiring
- Exposed electrical parts
- Overhead power lines
- Wires with bad insulation
- Electrical systems and tools that are not grounded or double-insulated
- Overloaded circuits



Recognizing Electrical Hazards

- Damaged power tools and equipment
- Using wrong PPE
- Using the wrong tools
- Some chemicals
- Broken ladders and scaffolding
- Ladders that conduct electricity
- Wet equipment



Evaluating Electrical Hazards

- Identify all possible hazards first, then evaluate the risk of injury from each individual hazard.
- Do not assume the risk is low until you evaluate the hazard. It is dangerous to overlook hazards.
- Job sites are especially dangerous because they are always changing.
 - Many people are working at different tasks.
 - Wet surfaces can increase hazards
- The risks in your work environment need to be evaluated all the time.

Controlling Electrical Hazards

- Create a safe work environment and use safe work practices.
 - Identify electrical hazards
 - Report risks to supervisors
- Create a Job Hazard Analysis
 - Break work down into a list of individual tasks
 - Identify and evaluate the hazards for each task
 - Develop a control for each hazard





Thank You

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