Office of Risk Management

Safety Spotlight

Electrical Safety

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Fundamentals of Electrical Hazards

- To flow, electricity must have a complete path.
- Electricity flows through *conductors.*
  - water, metal, the human body
- Insulators are non-conductors.
- The human body is a conductor.

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Fundamentals of Electrical Hazards

Have You Ever Been Shocked?

THE BASICS

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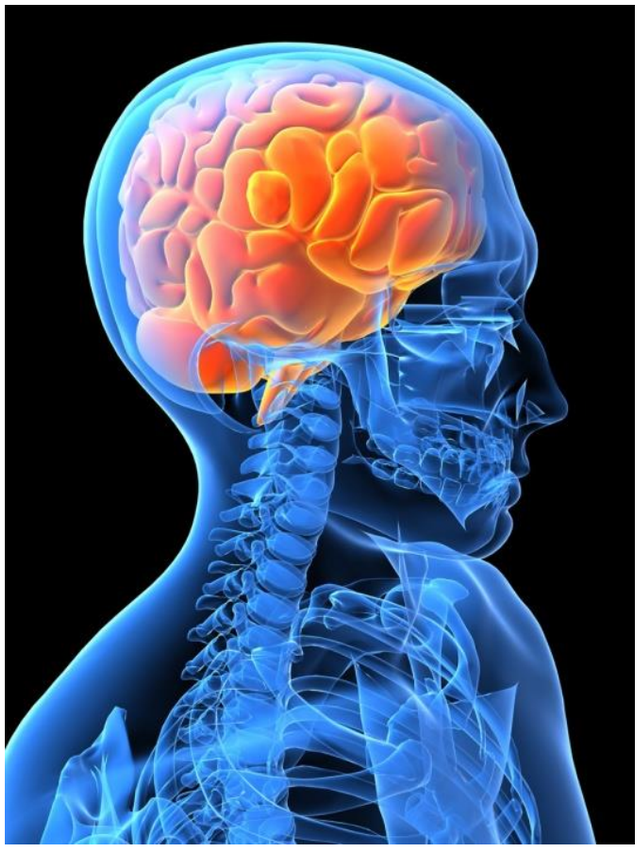
What are the levels of effect of current?

AC current (mA)	Effect on human body
1	**Slight tingling sensation**
2-9	**Small shock**
10-24	**Muscles contract causing you to freeze**
25-74	**Respiratory muscles can become paralysed; pain; exit burns often visible**
75-300	**Usually fatal; ventricular fibrillation; entry & exit wounds visible**
>300	**Death almost certain; if survive, will have badly burnt organs and probably require amputations**



What are the types of injuries?

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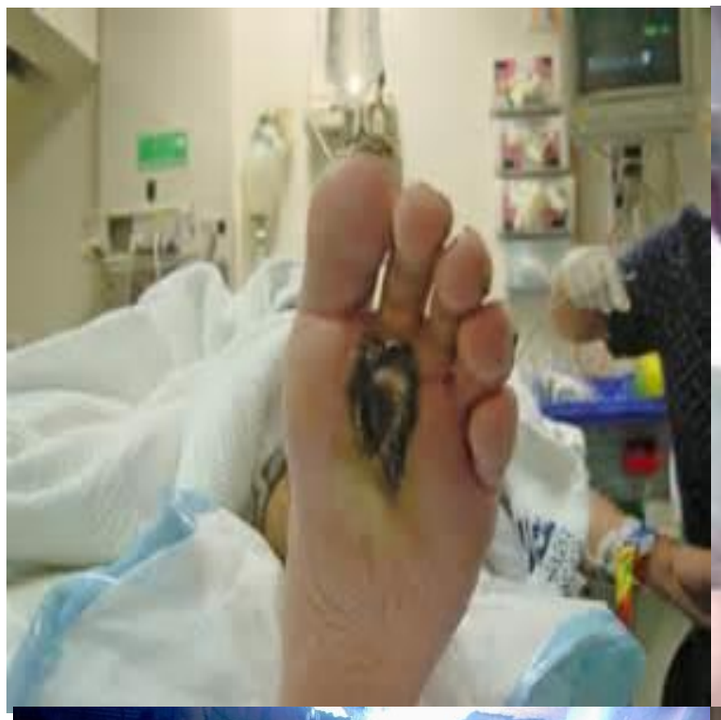
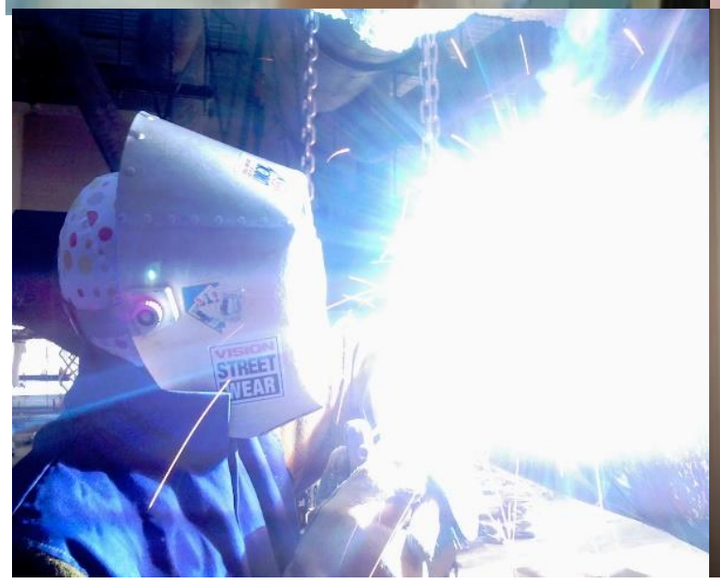
- **B**urns
- **S**hocks
- **A**rc
- **F**ire
- **E**xplosion





Fundamentals of Electrical Hazards

- Hazards of Electricity
  - Electrocution/Shock/Burns/Death
  - Minimum distance from overhead lines 10 ft.
  - Electrical tools and equipment

    Inspect for: frayed, cut, broken wires; grounding prong missing; improper use of cube taps; improperly applied or missing strain relief

Qualified vs. Unqualified Personnel

- For purposes of electrical safety, there are 2 types of workers: Qualified and Unqualified

A qualified worker:

- Is trained to avoid electrical hazards when working on or near exposed energized parts
- Is familiar with OSHA standards and work practices
- Can distinguish exposed live parts of electrical equipment
- Knowledgeable of the skills and techniques used to determine nominal voltages of exposed parts/components

Electrical Protection

- **Circuit Breakers**
  - Provided to protect EQUIPMENT not people
  - Do not reset breakers with a line voltage higher than 120V and only reset if you know why it tripped

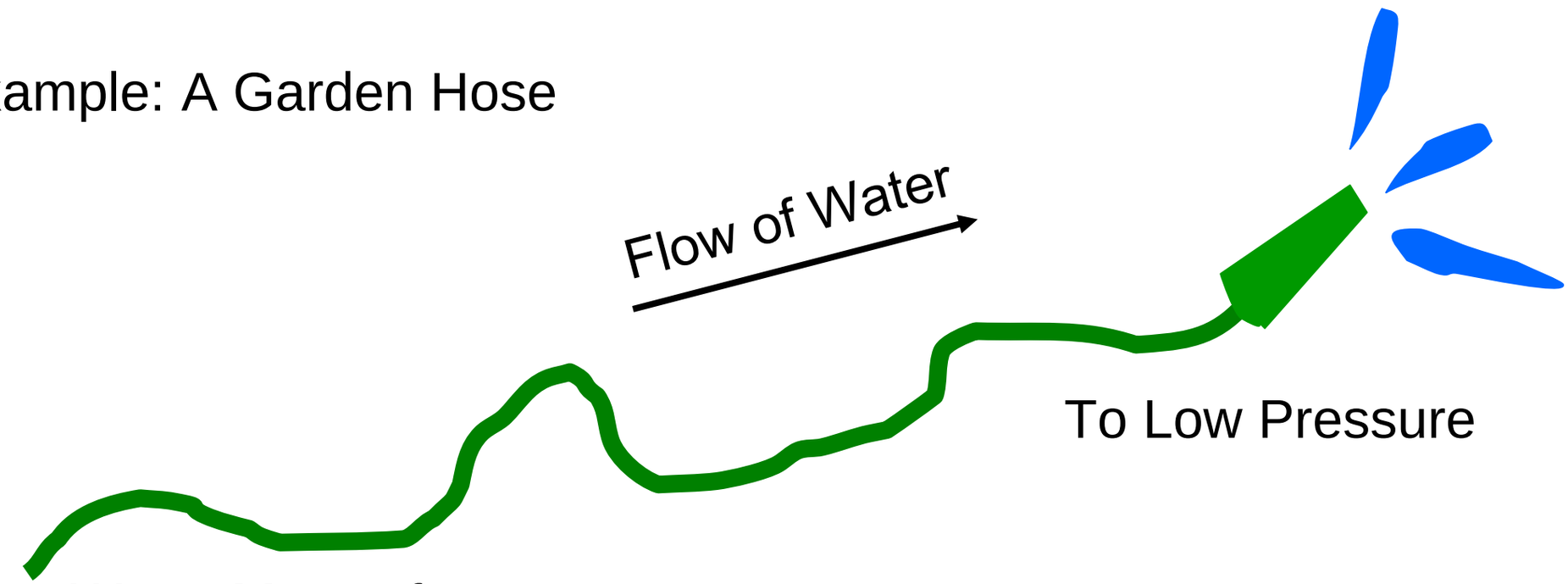
- **GFCI's**
  - Provided to protect people
  - Trip range 4-6ma
  - Monthly test

Electrical Protection

- **Distance**
  - If you sense the presence of an electrical hazard or exposed conductors that may be energized, keep your distance and <u>STAY AWAY.</u>

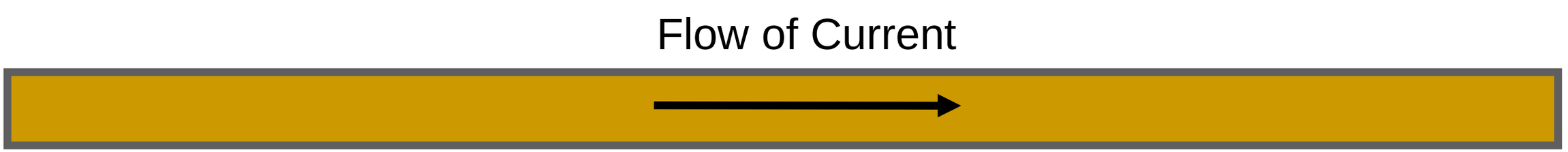
How Electricity Works

Example: A Garden Hose



Water Moves from
High Pressure

The same thing occurs in an Electrical Wire



Current Moves from
High Voltage

Fundamentals of Electrical Hazards

- Voltage
  - electrical pressure
- Amperage
  - electrical flow rate
- Impedance
  - restriction to electrical flow

Fundamentals of Electrical Hazards

- Circuit
  - path of flow of electricity
- Circuit Element
  - objects which are part of a circuit and through which current flows
- Fault
  - current flow through an unintended path

Fundamentals of Electrical Hazards

- What is Grounding?
  - Protection from electric shock
    - normally a secondary protection measure
- A ground is a conductive connection
  - between electrical circuit or equipment and earth or ground plane
  - creates a low resistance to the earth

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Ground-Fault Protection

The ground-fault circuit interrupter (GFCI) works by comparing the amount of current *going to* and *returning from* equipment along the circuit conductors. When the amount *going* differs from the amount *returning* by approximately 5 milliamperes, the GFCI interrupts the current within as little as 1/40 of a second.

Note: A GFCI will *not* protect you from line contact hazards (i.e. a person holding two "hot" wires, a hot and a neutral wire in each hand, or contacting an overhead power line). However, it protects against the most common form of electrical shock hazard, the ground-fault. It also protects against fires, overheating, and destruction of wire insulation.

Basic Rules of Electrical Action

- Electricity isn't live until current flows.
- Electrical current won't flow until there is a complete loop, out from and back to the power source.

Grounding - How Do I Avoid Hazards

- Ground all power supply systems, electrical circuits, and electrical equipment.
- Do not remove ground pins/prongs from cord- and plug-connected equipment or extension cords.
- Use double-insulated tools.
- Ground all exposed metal parts of equipment.

Do’s and Don'ts

- **Do** plug power equipment into wall receptacles with power switches in the Off position.
- **Do** unplug electrical equipment by grasping the plug and pulling. **Do not** pull or jerk the cord to unplug the equipment.
- **Do not** drape power cords over hot pipes, radiators, or sharp objects.

Do’s and Don'ts

- **Do** check the receptacle for missing or damaged parts.
- **Do not** plug equipment into defective receptacles.
- **Do** check for frayed, cracked, or exposed wiring on equipment cords.

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Do’s and Don'ts

- **Do** check for defective cords clamps at locations where the power cord enters the equipment or the attachment plug.

- Extension cords should not be used in office areas. Generally, extension cords should be limited to use by maintenance personnel.

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Do’s and Don'ts

- Employees should know the location of electrical circuit breaker panels that control equipment and lighting in their respective areas. Circuits and equipment disconnects must be identified.