Basic Electrical Safety

√ Course not designed to teach you to work on electrical equipment.

√ You will not be qualified to work on electrical equipment.

√ If you spot problems with electrical equipment you should report it to your supervisor.
Objectives

• Be familiar with the fundamental concepts of electricity.
• Be familiar with the effects of electricity on the human body.
• Be able to recognize common electrical hazards.
Objectives

- Be familiar with electrical protective devices.
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.

Fundamentals of Electrical Hazards
Fundamentals of Electrical Hazards

Have You Ever Been Shocked?

THE BASICS
Fundamentals of Electrical Hazards

- More than 3 ma
  painful shock
- More than 10 ma
  muscle contraction “no-let-go” danger
- More than 30 ma
  lung paralysis- usually temporary
- More than 50 ma
  possible ventricular fib. (heart dysfunction, usually fatal)
- 100 ma to 4 amps
  certain ventricular fibrillation, fatal
- Over 4 amps
  heart paralysis; severe burns. Usually caused by >600 volts
Fundamentals of Electrical Hazards

- Hazards of Electricity
  - Electrocution/Shock/Burns/Death
- Minimum distance from overhead lines 10 ft.
- Inspect all electrical tools and equipment
  - Frayed, cut, broken wires
  - Grounding prong missing
  - Improper use of cube taps
  - Improperly applied or missing strain relief
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
Distance
- If you sense the presence of an electrical hazard or exposed conductors that may be energized, keep your distance and STAY AWAY
Electrical Safety

Terminology

- HOT - BLACK - UNGROUNDED CONDUCTOR
- NEUTRAL - WHITE - GROUNDED CONDUCTOR
- GROUND - GREEN/BARE - GROUNDING CONDUCTOR
Figure 12: CURRENT FLOW IN A PROPERLY GROUNDED CIRCUIT

Basic Electrical Safety
Basic Electrical Safety
Figure 14: SHOCK FROM IMPROPERLY GROUNDED TOOL
Figure 15: Fault conditions sensed by a GFCI
Figure 16: CORRECTLY WIRED DUPLEX RECEPTACLE
Fundamentals of Electrical Hazards

- Voltage
  - electrical pressure (water pressure)
- Amperage
  - electrical flow rate (gallons/min)
- Impedance
  - restriction to electrical flow (pipe friction)
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.
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.
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.
Basic Electrical Safety

Preventing Accidental Electrical Contact

Electrocution
- Electricity
- Path
- Time

Prevention
- Keep Away
- Ground
- GFCI
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.
Do’s and Don'ts

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

- **Don’t** use extension cords in office areas. Generally, extension cords should be limited to use by maintenance personnel.
Do’s and Don'ts

- “Cheater plugs”, extension cords with junction box receptacle ends or other jury-rigged equipment should not be used.
Do's and Don'ts

- Consumer electrical equipment or appliances **should not** be used if not properly grounded. (Look for the UL Label)
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.
Do's and Don'ts

- Temporary or permanent storage of any materials **must not** be allowed within 3 feet of any electrical panel or electrical equipment.
- Any electrical equipment causing shocks or with high leakage potential must be tagged with a Danger tag or equivalent.
Myths and Misconceptions

- Electricity takes the path of least resistance.

- Electricity wants to go to ground.

- If an electric tools falls into a sink or tub of water, the item will short out.
Myths and Misconceptions

- AC reverse polarity is not hazardous.
- It takes high voltage to kill; 120 volts is not dangerous.
- Double insulated power tools are doubly safe and can be used in wet and damp locations.
SAFETY FIRST

THE SAFE WAY IS THE BEST WAY