

Electrical Safety



Concerned About Electricity?

- How many sets of Festival lights do you plug into one extension cord?
- Do you still use your hot and sparking electric drill?
- Is your vacuum cleaner's cord twisted and frayed?
- Have you installed outlet covers to protect your toddler's probing fingers?



Electrical Safety Goals

- Electricity and the human body
- Electrical hazards and safe work practices
- Quiz

Electrical Circuits

- Electrical source
- Electrical user
- Wires



Rules of Electricity

- Electricity travels in a completed circuit
- Electricity always travels in the path of least resistance
- Electricity tries to travel to ground
- All electrical work is governed by Eni Gas Permit to work

Electricity and People

- A person usually offers a less resistance for the electricity
- The person forms a completed circuit when touching the ground
- Electricity always tries to travel to ground

Voltages and Amperes

- Voltage = Amps X Ohms (resistance)
- Converting voltage to amps
- Typical Industrial Voltages
 - 110/120 Volts = 60 milliAmps (mA)
 - 220/240 Volts = 120 mA
 - 440/480 Volts = 240 mA



Effects on the Human Body

- 1 mA: Can be felt by the body
- 2-10 mA: Minor shock, might result in a fall
- 10-25 mA: Loss of muscle control, may not be able to let go of the current
- 25-75 mA: Painful, may lead to collapse or death
- 75-300 mA: Last for 1/4 second, almost always immediately fatal

Body's Resistance

- Skin offers most of the body's electrical resistance
- Increased resistance
 - Thick and callused skin (foot or hand)
 - Dry skin
- Decreased resistance
 - Thin skin (inner forearm)
 - Wet or sweaty skin
 - Broken or abraded skin (scratches)

Resistance Varies

- Different levels of electrical resistance for each person
- Ranges from 500 ohms to many thousands of ohms
- The greater the body's resistance, the less chance of harm
- A similar voltage shock can be minor to one person and deadly to another.

Additional Resistance

- Gloves
- Shoes
- Mats

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Training

- Qualified workers
 - How to identify exposed energized parts
 - How to safeguard or work on energized parts
- Unqualified workers
 - How electricity works
 - Risks of working with energized equipment
 - Tasks to be performed only by qualified workers

Hazard Control

- Electrical systems are inherently safe
- Injuries typically occur when:
 - Procedures are inappropriate
 - Procedures are not followed or ignored
 - Safety systems are circumvented

General Electrical Hazards

- High-voltage overhead power lines
- Damaged insulation on wires
- Digging or trenching near buried lines
- Broken switches or plugs
- Overloaded circuits
- Overheated appliances or tools
- Static electricity
- Flammable materials



Portable Power Tools

- Inspect portable power tools
- Never use damaged equipment
 - Tag it out of service
 - Have it repaired or replaced
- Never use portable power equipment in wet or damp areas
- Stop using power tools if they become hot or start sparking

Extension Cords

- Inspect and check for capacity
- For temporary work only
- Do not use as a rope to pull or lift objects
- Should not be fastened with staples or hung over hooks



Electrical Cord Inspection

- Deformed or missing pins
- Damaged outer jacket or insulation
- Evidence of internal damage
- If damaged, take out of service until repaired

Circuit Protection

- Energize or de-energize with appropriate switches, breakers, etc.
- Do not energize or de-energize with fuses, terminal lugs, or cable splice connections
- If circuit protection device is tripped—inspect

Grounding Equipment

- Most electrical equipment is designed with a grounding system
- Do not use equipment with damaged grounding connectors
- Do not use adapters that interrupt the grounding connection

Ground Fault Circuit Interrupters

- GFCIs reduce the likelihood of fatal shocks
- Detect small amount of earth current and automatically switch off the power
- Used with extension cords and portable tools
- Fuses and circuit breakers protect equipment, not people

Static Electricity

- Created when materials rub together
- Can cause shocks or even minor skin burns
- Reduced or prevented by:
 - Proper grounding
 - Rubber matting
 - Grounding wires, gloves, or shoes

Flammable/Ignitable Materials

- Flammable gases, vapors, or liquids
- Combustible dust
- Can be ignited by static electricity
- Require specially designed electrical equipment

Machine Operators

- Never tamper with electrical interlocks
- Do not repair electrical components of your machine
- Properly shut off machinery before working in the point of operation
- Obey warning signs and follow safe procedures

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Summary

- Electricity will try to reach ground even if it means going through a person
- Even the “small” voltage from your home can cause serious injury
- Always inspect power tools and cords and do not use them if damaged
- Do not attempt to repair electrical equipment unless trained and qualified

Quiz

1. Where does electricity always want to go, even if it means traveling through a person? _____
2. A shock from an outlet at home may be painful, lead to collapse, or even death. **True or False**
3. Which part of the human body offers the most electrical resistance? _____.
4. Flammable materials can easily be ignited by _____ electricity.
5. Only _____ workers are permitted to work on or near exposed electrical components.

Quiz (cont.)

6. When should power tools and extension cords be inspected? _____
7. Fuses and circuit breaker are designed to protect people from shocks. True or False
8. When a circuit breaker trips, you should immediately reset it. True or False
9. Extension cords should never be used as a permanent power source. True or False
10. What should be done with a damaged power tool or extension cord? _____

Quiz Answers

1. Electricity always wants to travel to ground, which will complete the circuit.
2. True. A 120-volt outlet at home can give the average person a shock of 60 mA.
3. The skin offers the most electrical resistance.
4. Static electricity can easily ignite a flammable material.
5. Only qualified and trained workers can repair or troubleshoot electrical equipment.

Quiz Answers (cont.)

6. Inspect power tools and extension cords before each use.
7. False. Fuses and circuit breaker protect machinery and electrical systems.
8. False. A tripped breaker could indicate a problem, so it should be checked by a qualified worker.
9. True. Extension cords are designed as a temporary power source.
10. Tag it out of service and have it replaced or repaired by a qualified worker.