Introduction
Electricity is at home, at work, and in our recreational areas. It provides the energy that makes many of our tasks much easier and life more pleasant. It powers machinery, provides heating and cooling, energizes lights, pumps our water, and runs home and office equipment. When used correctly, electricity essentially goes unnoticed. But, if something goes wrong, there may be injuries, death, fires, and costly equipment and building damage. We will discuss:

• Basic electricity concerns.
• Identifying and avoiding electrical hazards.

Definitions
To understand electricity, it is important to know some basic definitions.

• **Current** – Measured in amperes, is the movement of an electrical charge.
• **Resistance** – Measured in ohms, is the opposition to current flow.
• **Voltage** – Measured in volts, is the measure of electrical force.
• **Conductors** – Materials with little resistance to electrical current flow.
• **Insulators** – Materials with high resistance to electrical current flow.
• **Grounding** – A conductive pathway that permits electrical current flow to the earth. This is part of the electrical safety protective system.

• **Shocking current** – An electrical current that passes through a body part. The shock’s severity depends on the voltage, amperage, and resistance. The greater the current, the greater the shock.

• **Arc flash/blast** – The resulting flash and pressure wave when an electrical fault occurs. The temperature may approach 35,000 degrees Fahrenheit and molten components may cause serious injuries.

**Discussion**

Despite a downward trend starting in 2007, annual non-fatal electrical injuries have levelled off since 2012. Many electrical injuries result in considerable lost work time, with 41% of injuries requiring more than two weeks away from work. Workers in installation, maintenance, repair, and construction occupations account for the largest number of injuries. However, a substantial number of injuries involve occupations that may not be familiar with electrical hazards, including service, production, transportation and material moving, and sales and related occupations.

To organize the efforts of bringing electricity into society, code organizations began writing codes to avoid undesirable consequences. Underwriters Laboratories and the National Fire Protection Association (NFPA) are examples of these code organizations. In addition, they make the use of electricity safer.

When the human body becomes part of an electrical path or circuit, injuries may occur. These include shock, burns, nerve/organ damage, loss of vision, and death. In addition, other secondary results such as falls may happen.

An electrical shock’s severity depends on the quantity of the current, the electricity’s path through the body, and the length of time the current passes through the body.

Electricity that is out of control may result in fire, explosions, and equipment damage. The distance from an arc/blast along with enclosure and personal protective equipment determine how it will affect the body.

**Electrical safety practices**

- Properly ground electrical equipment to prevent against electrical shock.
- Maintain good working order for electrical power tools and equipment.
- Use ground-fault circuit interrupters to protect against shock.
- To protect against unintentional contact, use guarding for live parts of electrical equipment that operate at 50 or more volts.
- Identify and discuss job hazards, including electrical hazards, in a pre-job analysis before beginning work.
- Ensure workers receive adequate electrical safety training by qualified persons for their job assignments.
- Isolate equipment with arc flash or arc blast hazards to ensure only qualified workers are allowed near.
- De-energize machinery when it needs any kind of maintenance; workers must ensure machinery is brought to a zero-energy state.
- Provide workers with the correct personal protective equipment (PPE) for their jobs; properly train workers in proper use of PPE.
- Use signage to clearly mark electrical hazards.

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Hazard identification

- Check the insulation on power cords and plugs daily and discard if worn or damaged.
- Have a qualified person repair any damaged cords.
- Do not plug several power cords into one outlet.
- Do not use cheater plugs or work arounds for connections, it interrupts grounding conditions.
- Pull the plug, not the cord.
- Ensure strain relief is used for cord and plug connections.
- Replace broken three-prong plugs and make sure the third prong is properly grounded.
- Never use extension cords as permanent wiring.
- If using extension cords to temporarily supply power during a construction activity, use a ground fault circuit interrupter (GFCI).
- Keep power cords away from water and oil. They can damage the insulation and cause a shock.
- Flexible cords and cables are limited to certain installations, check code requirements for proper installation.
- Ensure electrical connections and equipment are protected in wet locations.
- Inspect GFCIs as prescribed by the manufacturer.
- Use tools and equipment that is double insulated and or properly grounded.
- Enclose exposed current-carrying devices to prevent inadvertent contact and protect from electric shock.
- Ensure electrical devices such as circuit breakers (not tripping and being reset) are in proper working order and that other equipment is free from electrical faults.
- Unusually warm, hot, or damaged outlets may be a sign of unsafe wiring conditions.
- Clearly label all circuit breakers and fuse boxes.

Group activity

Look for electrical hazards, ask employees to do a walk-around inspection of their work areas. Schedule time for a group discussion of their findings and the solutions they propose for each identified concern. Conduct a follow-up inspection to verify there is corrective action.

Conclusion

Incorporating the principles mentioned here will go a long way in preventing injuries and fatalities resulting from direct and indirect exposure to electrical hazards. Implementing effective employee training, hazard identification, and hazard correction in the workplace are necessary for a safe work environment.

Resources


The National Institute for Occupational Safety and Health has a variety of information and guidance on electrical safety, as well as links to electrical safety resources, at: [www.cdc.gov/niosh/topics/electrical/](http://www.cdc.gov/niosh/topics/electrical/)

The Occupational Safety and Health Administration has information on electrical safety standards, hazard recognition, training opportunities, and solutions, and other information at: [https://www.osha.gov/SLTC/electrical/](https://www.osha.gov/SLTC/electrical/)