Be Aware of the Dangers of Electrical Shock

Electricity is such a familiar part of our lives that it is often not treated with enough caution. An electrical shock is received when electrical current passes through the body.

What effect do shocks have on the body?

The effects of an electric shock can range from a slight tingling sensation to immediate cardiac arrest. The severity depends on several factors.

- The length of time of the shock greatly affects the level of injury. If the shock is short in duration, it may only be painful. A longer shock, lasting a few seconds, could be fatal if the level of current is high enough to cause the heart to go into ventricular fibrillation or cause respiratory paralysis.
- The amount of current passing through the body affects the severity of an electrical shock. Greater voltages produce greater currents. As a result, there is greater danger from higher voltages.
- The current's path through the body will affect the severity of the shock. A current passing through the fingers may cause minor damage with lower voltage/current exposures, while higher voltage/current exposures could cause finger loss. However, even a low voltage/current exposure across the heart could be lethal.
- The greater length of time the body is exposed to the electricity, the greater the damage to tissues.
- The electrical current's frequency will affect the type of tissue injury. Higher frequencies tend to cause surface burns, while lower frequencies tend to penetrate deeper into the body.

This table shows the general relationship between the amount of current received and the reaction when current flows from the hand to the foot for just one second.

Current	Reaction
Below 1 milliamp	Generally not perceptible
1 milliampere	Faint tingle
5 milliamperes	Slight shock felt; not painful but disturbing. Average individual can let go. Strong involuntary reactions can lead to other injuries.
6–25 milliamperes (women)	Painful shock, loss of muscular control*
9–30 milliamperes (men)	The freezing current or "let-go" range. * Individual cannot let go, but can be thrown away from the circuit if extensor muscles are stimulated.
50–150 milliamperes	Extreme pain, respiratory arrest, severe muscular contractions. Death is possible.
1,000–4,300 milliamperes	Rhythmic pumping action of the heart ceases. Muscular contraction and nerve damage occur; death likely.
10,000 milliamperes	Cardiac arrest, severe burns; death probable

**If the extensor muscles are excited by the shock, the person may be thrown away from the power source.*

Continued

Sometimes High Voltages Lead to Additional Injuries

High voltages can cause violent muscular contractions. You may lose your balance and fall, which can cause injury or even death if you fall into machinery that can crush you. High voltages can also cause severe burns.

At 600 volts, the current through the body may be as great as four amps, causing damage to internal organs, such as the heart. High voltages also produce burns. In addition, internal blood vessels may clot. Nerves in the area of the contact point may be damaged. Muscle contractions may cause bone fractures either from the contractions themselves or from falls.

A severe shock can cause much more damage to the body than is visible. A person may suffer internal bleeding and destruction of tissues, nerves, and muscles. Sometimes the hidden injuries caused by electrical shock result in a delayed death. Shock is often only the beginning of a chain of events. Even if the electrical current is too small to cause injury, your reaction to the shock may cause you to fall, resulting in bruises, broken bones, or even death.

The path of the electrical current through the body affects the severity of the shock. Currents through the heart or nervous system are most dangerous. If a live wire touches your head, your nervous system may be damaged. Contacting a live electrical part with one hand –while you are grounded at the other side of your body – will cause electrical current to pass across your chest, possibly injuring your heart and lungs.

What should you do if someone" freezes" to a live electrical contact?

If a person is "frozen" to a live electrical contact, shut off the current immediately. If this is not possible, use boards, poles, or sticks made of wood or any other nonconducting material and safely push or pull the person away from the contact. It is important to act quickly, but remember to protect yourself from electrocution or shock.

How can you tell if a shock is serious?

A severe shock can cause considerably more damage than meets the eye. A victim may suffer internal hemorrhages and destruction of tissues, nerves, and muscles that are not readily visible. Renal damage also can occur. Seek emergency medical help immediately if you or a co-worker receives a shock.

What work practices can help protect you against electrical hazards?

Electrical accidents are largely preventable through safe work practices. Examples of these practices include the following:

- De-energizing electric equipment before inspection or repair.
- Keeping electric tools properly maintained.
- Exercising caution when working near energized lines.
- Using appropriate personal protective equipment.

Electrical safety-related work practice requirements are detailed in the Occupational Safety and Health Administration (OSHA) regulations 29 CFR Part 1910.331 through 1910.335 for general industry and 29 CFR Part 1926.416 to 1926.417, for construction trades.

Source: OSHA 3075 2002 (revised)

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