



Electrical Safety

Talking Points

Importance of Ground Fault Circuit Protection. How does it work?

Ground Fault Circuit protection is designed to prevent against electrical shock. The protective device most commonly used is known as a Ground Fault Circuit Interrupter (GFCI). GFCIs are found on power tools and on GFCI electrical outlets. How does it work? A GFCI monitors for a current imbalance in the circuit and stops the flow of electricity if that condition occurs. If there is a leakage in current, the GFCI will quickly disconnect the circuit to prevent electrocution. Without ground fault protection, the leakage of current can travel to the worker, resulting in severe injuries, even death. GFCIs will *not* protect workers from a current overload – fuses and circuit breakers perform that task.

What does a Ground Fault Circuit Interrupter (GFCI) look like?

There are three types of GFCI protectors.

- 1) The most popular is the GFCI receptacle or outlet. It looks and acts like a regular electrical outlet, but will have two small buttons typically located in the center of the outlet. The buttons are marked “test” and “reset”, sometimes in 2 different colors, sometimes the same shade as the GFCI receptacle body.
- 2) GFCI portable devices plug into other outlets, such as tools and equipment, providing protection to whatever is plugged into them. Some look like an extension cord with a thicker section containing the protective device, other have a weatherproof enclosure with a built in GFCI receptacle.
- 3) GFCI circuit breakers act in a manner like a GFCI receptacle. While a GFCI receptacle disconnects hot and neutral conductors, a GFCI breaker takes care of the hot only / the neutral remains closed. As with its namesake, this device looks like a circuit breaker but has a test button, which should trip the breaker handle to the center position when depressed.

In addition, some appliances are equipped with built-in GFCIs. Many hand-held hair dryers and portable air conditioners incorporate a GFCI into their plugs, and have “test” and “reset” buttons like other GFCIs.

Maintaining access to electrical panels. Why and how much access?

Breaker panels should be easily accessible. They must never be blocked. If there is a spark or a panel box overheats, nearby flammable materials like cardboard boxes may ignite. When employees work too close to open panels or exposed wires, contact with electricity may result. Materials that conduct electricity, such as metal bins or ladders, may cause serious electrical burns or death if they contact live breaker boxes or wiring.



Finally, panels must be kept clear of any obstructions. In the event of an emergency, where there is an immediate need to disconnect power to a machine or other electrical source, access to power panels must not be hampered. Storage is meant for designated storage rooms, not electrical utility rooms

OSHA Standard 29 CFR 1910.303 (g), mandates 3 feet of clearance around electrical services and breaker panels between 120 and 250 volts. Also, the working width around the panel must be at least 30 inches.

Why must damage to electrical equipment be reported? What problems can result?

Employees must report damage to electrical equipment to prevent workplace injury and fire hazards. If machinery or equipment is missing guards or covers, employees or materials may contact exposed wires. Touching exposed wiring can result in shock or electrocution. Items to report to a supervisor include frayed or damaged power cords and missing ground prongs from electrical cords.

Electrical equipment that appears to be overheating, tripping the breaker, constantly shutting down or not operating correctly, could indicate a serious problem. Panel boxes or other electrical equipment that malfunction often can be fire hazards, and even cause an arc flash. Arc flashes can cause severe injuries or death. Employees are responsible for reporting electrical problems to their supervisor. The equipment then should be taken out of service and locked out to prevent other workers from operating them.

Do not snip off a ground prong. Why?

The third prong connects to the grounding wire, thereby bonding the electrical equipment to ground. If this grounding path is broken at any point, such as when a ground prong is missing, the operator of the tool or equipment is at risk of shock or electrocution.

When there is a defect in the grounding of tools, machines or equipment that workers are using there is typically no protection from electrical shock. Equipment grounding can only work when there is a permanent and continuous electrical connection between the equipment and the earth.

Why can workers fall off a ladder when working with electricity?

An electrical shock can be powerful enough to propel an employee off the ladder or cause them to lose their balance and fall. When working with electricity, metal ladders never should be used. Metal ladders can conduct electricity. Always choose a nonconductive ladder, preferably made of fiberglass.



Lock out/Tag out – when does it apply?

If employees service or maintain machinery, where the unexpected startup, energization, or the release of stored energy could cause injury, it is likely the OSHA standard for the control of hazardous energy (1910.147), or “lock out/tag out” would apply. The standard applies to all sources of energy, including electrical energy.

The standard requires release of stored energy, and preventing accidental start-up, when employees are involved in service or maintenance activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining or servicing machines or equipment.

Workers performing service or maintenance activities during normal production operations must follow lock out/tag out procedures if they remove or bypass machine guards or other safety devices, place any part of their bodies in or near a machine's point of operation, or place any part of their bodies in a danger zone associated with machine operations.

Work involving minor tool changes and adjustments or other minor servicing activities that are routine, repetitive, and integral to the use of the production equipment and that occur during normal production operations are not covered by the lockout/tagout standard. An exception to locking or tagging out also applies for equipment where the employee has total control over a power cord or plug.

Electrical shocks, burns and electrocution. What's the difference?

An electrical shock is received when electrical current passes through the body. It occurs when the body becomes part of the circuit, usually by touching a live wire and an electrical ground, touching a live wire and another wire at a different voltage, or touching an improperly grounded machine.

The severity of the shock depends on the path of current through the body, the amount of current flowing through the body (amps), and the how long the body contacts the current. Very small currents can result in a simple jolt or tingle sensation. However, it does not take much current to result in a more serious injury. When higher current passes through the body it may be impossible for a shock victim to let go of the energized object, resulting in serious burns or death.

Electrical burns are the most common electrical related injury. It usually occurs when you touch electrical wiring or equipment that is improperly used or maintained. Burns typically occur on hands, resulting in a very serious injury that needs immediate attention.

Electrocution is *death* by electrical shock. The higher the current, the more likely it is to be lethal. With a longer duration of exposure to high voltage, there is an increased chance of being killed. The pathway is also a major factor; if the current passes through the chest or head, the likelihood of death increases.



Danger of Fire – how heat is generated in an electrical cord?

Electricity is a form of energy, which is converted to other forms of energy to perform a task. When this conversion takes place, some heat is always produced. There is also some heat produced in the wiring connected to an electrical device. For example, light energy in an electric lamp, mechanical energy in electric motors, and thermal energy in electric heaters.

If a fault develops, the current (and heat energy) can increase to the extent that either the appliance burns out, the connecting wiring overheats and melts the plastic insulation or the plug and socket may burn out. An electrical fire can then occur where the overheated wiring, motor, plug or other electrical heat source are in contact with, or close to

flammable or combustible material. Common causes of fires include overloaded wiring, malfunctioning circuit breakers or fuses, loose wiring connections, electrical faults in appliances, and electrical “arcing.”

Electrical cord and surge protector safety: Hazards of overloading or running under rugs, through windows and doors.

Every year, thousands of fires result from the improper use of surge protectors, power strips and electrical extension cords. When overloaded outlets and circuits carry too much electricity, they generate heat. The heat causes wear on the internal wiring system and can ignite a fire.

Surge protectors, power strips or extension cords are not a substitute for permanent wiring. Use surge protectors or power strips that have an internal circuit breaker. These units trip their internal breaker if the power strip is overloaded or shorted. To prevent overloading, never plug more than two appliances into an outlet at once or “piggyback” extra appliances on extension cords or wall outlets. Use only outlets designed to handle multiple plugs.

Inspect electrical cords for damage and replace those that are cracked or frayed. Frayed or loose wires cause fires. Never run a cord under a rug. The cord can be damaged or compressed and lead to a fire. Running electrical cords through windows and doors can result in damage to cord itself, exposing wiring.