

Electrical safety tips

INTRODUCTION

Reasonable people, knowing the danger, would never stand under a tree or on a hill during a thunderstorm where they might be struck by a bolt of lightning. Yet, these same people sometimes become careless about protecting themselves and their families against other outdoor electrical hazards that can cause a fire, produce a shock or even electrocute.

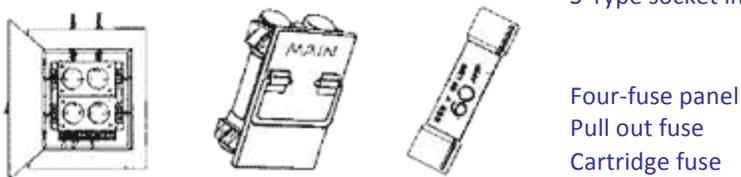
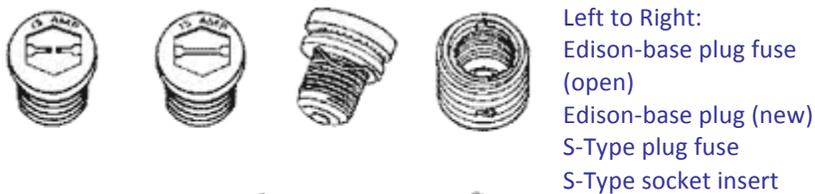
Water, which doesn't mix with electricity, can be found in unexpected places outdoors.

A tall ladder, even wooden, carried in an upright position can accidentally come in contact with an overhead power line with possibly fatal results.

ELECTRICAL SAFETY DEVICES

WHAT ARE ELECTRICAL SAFETY DEVICES?

Four devices that help provide outdoor electrical safety: **Circuit breakers** or **fuses** protect against **over current** conditions that could result in potential fire and shock hazards.



Ground-fault circuit interrupters (GFCIs) protect against potentially lethal shock when they detect even minute, but potentially dangerous **ground faults**, or "leaks" of electrical current from the circuit. GFCIs may be incorporated into circuit breakers protecting the entire circuit, outlets protecting everything on the circuit downstream from the GFCI outlet, or as portable devices that can be used at an outlet to give protection for a particular electrical item.

Three-pronged plugs and outlets, and polarized plugs and outlets offer enhanced protection against potential shock when provided on specific products. These measures should never be circumvented by sawing or breaking off the third prong or attempting to widen an outlet slot.

[Arc fault circuit interrupters \(AFCIs\)](#) are relatively new devices that protect against fires caused by the effects of unwanted electrical arcing in wiring. An AFCI will de-energize the circuit when an arc fault is detected.

Electrical wiring in buildings with areas exposed to the outdoors, including circuits in garages, porches, patios and storage areas, could benefit from the additional electrical fire prevention features of AFCI devices when incorporated in the branch circuitry.

HOW DO ELECTRICAL SAFETY DEVICES WORK?

[Circuit breakers](#) or [fuses](#) in your home electrical panel sense [over current](#) conditions and [short circuits](#) and reduce the risk of fire in your electric wiring. When you overload a branch circuit by plugging in too many products, the [fuse](#) blows or the [circuit breaker](#) trips to shut off power.

Up-to-date single-family dwellings should be provided with at least one branch circuit that carries power to an outdoor outlet. Locate your outdoor branch circuit(s) on the listing of branch circuits on your electrical panel. (If you have no outdoor wall outlet, call a qualified electrician to install one.) You should find the [amperage](#) on the [circuit breaker](#) or the [fuse](#).

To figure out whether a combination of products will overload a branch circuit, add up the power ratings ([watts](#)) you plan to use at the same time on that circuit. The power ([watts](#)) or [amperage](#) of an electrical product is shown on its attached nameplate.

[Volts](#) (also on nameplate) x [Amps](#) = Power ([wattage](#)) For example: 120 V x 15A= 1800 W Demanding more than 1800 W will overload a 15 ampere circuit.

Outdoor electrical products that may use a significant portion of the power a branch circuit can supply are electric lawn mowers, leaf blowers and snow blowers.

Be sure to figure total [wattage](#) in advance when you are planning an outdoor event. Add up the power ratings of everything you will use: garden lights, electric grill, hot tub and so on plus everything else on the circuit. If you exceed the circuit wattage limitation, you will likely trip a [circuit breaker](#) or blow a [fuse](#) which can cause hidden damage to the circuit. If necessary, plan to redistribute your power needs to more than one branch circuit, or reduce the electrical load to avoid the overload situation.

A [short circuit](#) in a product, cord or plug may also trip your [circuit breaker](#) or blow a [fuse](#). If you can identify the product that is causing the problem, take it to a manufacturer-recommended repair facility. If you don't know what is causing your [circuit breaker](#) to trip or [fuses](#) to blow, call a qualified electrician.

A [ground-fault circuit interrupter \(GFCI\)](#) will disconnect power automatically when a plugged-in electrical product leaks electricity to [ground](#). Outdoors, where water and electricity can easily inadvertently come together, a GFCI is a lifesaver, not a luxury. A GFCI is a simple device reasonably priced. If you are unsure about installation, seek a qualified electrician.

GFCIs protect against shock or electrocution when a plugged-in electrical product is dropped into a sink, pool, pond, puddle, or hot tub (a shock may be felt in the split second before the GFCI trips). A GFCI also cuts off current when a person contacts a product like an electric heater or an electric power tool, which may be "leaking electricity."

The National Electrical Code now requires GFCIs for protection in the bathroom, garage, kitchen and outdoor outlets of new homes.

Outlet type GFCI



Circuit breaker type
GFCI



Portable type GFCI



No GFCIs installed?

Buy one. GFCIs come in several models, including a portable plug-in type.

Attach a portable GFCI between the power receptacle and the plug of any electric saw, lawn edger, weed trimmer or other outdoor (or indoor) electrical equipment; or have a qualified electrician install receptacle or circuit breaker GFCI protection for your family. Make sure you have GFCIs for swimming pool underwater lighting circuits, for electric circuits of hot tubs, and for wall outlets within 20 feet of such pools as required in the National Electrical Code.

Testing GFCIs

To be sure your life-protecting GFCIs are working properly, use this test or the instructions that come with the GFCI.

1. Plug a night light (or radio turned up loud, if you have a circuit breaker GFCI) into a GFCI-protected wall outlet, and turn it on.
2. Press the GFCI test button or switch. The light or radio should go off.
3. Press the reset feature to restore power.

If the light or radio does not go off when the test button or switch is pressed, the GFCI is not working or is not wired correctly. Contact a qualified electrician to correct the problem or install a new GFCI.

A [3-pronged plug](#) used in a 3-hole outlet protects against shock from a defective electrical product, cord or plug with [grounding](#) problems.

Electricity to power your electrical products travels along a path called a circuit. As long as it stays in its intended path while traveling to "[ground](#)," it does its job with minimal risk of electric shock. But when a product, cord or plug is damaged, out-of-path electricity may energize expose metal parts as it seeks a new path to [ground](#). If you come in contact with energized conductive parts and provide a path to ground, the electricity will deliver a shock. The third prong on a plug is there to carry any stray electricity to [ground](#) through a 3-pronged receptacle.

Many electrical products designed for outdoor use have **3-pronged plugs** (except for power tools and other products which may protect you against shock with a system of double insulation).

Never, ever, remove the third prong of a 3-prong plug.

If your outdoor wall outlet has room for only 2 prongs, you should replace it with a GFCI-protected, 3-hole grounding type receptacle. When using a 3-to-2 grounding adapter, be certain that the receptacle itself is **grounded** or GFCI-protected for the adapter to work. Use a circuit tester (available in hardware stores) to find out if your outdoor receptacles are **grounded**, or call a qualified electrician to help you make sure.

Arc-fault circuit interrupters (AFCIs)

Problems in home wiring, like arcing and sparking, are associated with more than 40,000 home fires each year. These fires claim over 350 lives and injure 1,400 victims annually.

A new electrical safety device for homes, called an **arc fault circuit interrupter or AFCI**, is expected to provide enhanced protecting from fires resulting from these unsafe home wiring conditions.

Typical household **fuses** and **circuit breakers** do not respond to early arcing and sparking conditions in home wiring. By the time a **fuse** or **circuit breaker** opens to defuse these conditions, a fire may already have begun.

Requiring AFCIs

AFCIs are already recognized for their effectiveness in preventing fires. The most recent edition of the National Electrical Code, the widely-adopted model code for electrical wiring, requires AFCIs for bedroom circuits in new residential construction, effective January 2002.

Future editions of the code, which is updated every three years, could expand coverage to other **circuits**, including outdoor **circuits**.

Hazards In Use of Electrical Products Outdoors How to Avoid Outdoor Electrical Accidents



Water	Keep outlets covered. Use a Ground fault circuit interrupter (GFCI) . Keep products with line cords away from sinks, puddles, pools, ponds, and hot tubs. Keep outdoor outlets weather-protected with outlet covers.
-------	---

Disabled 3-prong plug	Never remove third prong. Dispose of electrical items and extension cords with damaged prongs.
Damaged product wiring	Replace or have damaged parts, cords, plugs repaired by qualified professionals before use.
Improper product operation. Exposed blades or moving parts	Read instruction manual. Use goggles or other safety aides. Never bypass a safety device.
Unattended products	Switch off, unplug, store and lock products not in use.
Extension cord misuse	Match product power needs (on product labels and in manuals) to extension cord label information and make sure they are rated appropriately for outdoor use.
Improper product storage	Store outdoor electrical products indoors.
Overloaded branch circuits	Limit power use on each branch circuit to its rated capacity.
Use of indoor product outdoors	Use only weather-resistant products outdoors.
Power line contact	Contact your regional utility protection center to locate buried power lines before digging or drilling. Locate overhead power lines before trimming trees, flying kites or house painting, and keep ladders away.
Pad-mounted electrical equipment	Keep off and away from this electrical equipment. If you notice the cabinet doors or locks have been tampered with or left open, contact your local utility immediately.
Gasoline, naphtha fumes	Avoid where electrical sparks may cause fire or explosion.

Before you use any electrical products outdoors:

- ⌚ Make sure it was intended for outdoor use. Does the product's instruction manual or an attached label warn, "Not for Outdoor Use" or "Indoor Use Only"? Unless an electrical product is designed to be weather resistant, a sudden summer shower can ruin the product and turn it into a serious shock hazard. Most electrical products intended for continuous outdoor use have heavily insulated cords and molded-on plugs to prevent moisture from seeping in.
- ⌚ Study all instructions carefully. Keep the instruction manual where you can easily find it. Reread it from time to time to refresh your memory.
- ⌚ Inspect products for damaged cords, plugs or wiring. Turn the product off and unplug it if a cord overheats. Take a damaged product to the manufacturers authorized repair center or have a qualified electrician repair it.

Make sure a recognized testing laboratory certifies the product. This insures that the product is designed and manufactured in accordance with established safety standards. Look for these and other markings of internationally recognized testing laboratories:



SAFETY RULES

Follow these safety rules for every electrical product you use outdoors:

Outdoor portable electrical appliances and power tools should always be:

- ⌚ Plugged in and turned on only when in use.
- ⌚ Turned off and in lock position when being carried or hooked up to attachments like mower baskets or saw blades.
- ⌚ Stored indoors (with a few exceptions such as electric barbecue grills, which can be covered to remain outdoors) and away from water and excessive heat.
- ⌚ Used only when all safety guards are in place. Sharp blades and rapidly moving parts can cut off a finger or a toe.

Outdoor portable electrical appliances and power tools should never be:

- ⌚ Left unattended outdoors, even when you leave temporarily. If there is a key, remove it. Put the product where no curious child or unqualified adult can misuse it.
- ⌚ Plugged in while the switch is in the "on" position or while being carried or moved.
- ⌚ Carried by their cords.
- ⌚ Used while wet or close to water.
- ⌚ Used near sharp edges or in conditions that might damage the product, its cord or its plug. Loose and broken wires are both shock and fire hazards.
- ⌚ Repaired by anyone who is not a licensed electrician, authorized by the manufacturer or trained to repair the particular product.

Follow these rules to avoid water hazards:

- ⌚ Keep outdoor outlets covered and dry between uses. New outlet covers are available that offer weather protection while a plug is inserted into the outlet.
- ⌚ Except for electric snow blowers and other appliances designed for use in a wet environment, select a dry day to power-up outdoors.
- ⌚ Keep cords and plugs away from sweating pipes and puddles.
- ⌚ If an electrical product falls into water, make sure you are dry and not in contact with water or metal surfaces and unplug it immediately. Do not reach into the water for it.
- ⌚ Use a [ground-fault circuit interrupter \(GFCI\)](#).

HOT TUBS, SPAS, AND POOLS

Follow these rules to avoid hot tub, spa, and pool hazards:

- ⌚ Keep outlets near hot tubs, spas and pools covered and dry between uses. New outlet covers are available that offer weather protection while a plug is inserted into the outlet.
- ⌚ Keep cords and plugs away from hot tubs, spas and pools and puddles from wet bathers. Never handle electrical items, plugs or outlets when wet.
- ⌚ If an electrical product falls into water, do not reach into the water for it. Make sure you are dry and not in contact with water or metal surfaces and unplug it immediately or shut off the circuit powering the item.
- ⌚ Hot tubs, spas and pools, and outlets on or near them should be protected by a [ground-fault circuit interrupter \(GFCI\)](#). Many older swimming pools that pre-date the introduction of GFCIs in the 1970s should be upgraded to add GFCI protection for branch circuits supplying power to underwater pool lights operating above 15 volts, and outlets within 20 feet of the pool.

Note, however, that when a person is immersed in an isolated body of water, like a hot tub, the water could become electrified without involving a ground fault as the electric current passes through water (and perhaps a person) from one electrical pole to the opposite pole. In this case, the GFCI may not provide shock or electrocution protection.

EXTENSION CORDS

Guidelines for selecting and using outdoor extension cords:

- ⌚ Use only extension cords marked "For Outdoor Use." Weather-resistant, medium-to-heavy [gauge](#) extension cords have connectors molded onto them to prevent moisture from seeping in and outer coatings that are designed to withstand being dragged along the ground.
- ⌚ Outdoor extension cords come in 25 to 150 foot lengths. Buy only the length you need. Above 100 feet you can lose power-a hazard when using power tools.
- ⌚ Use three-wire extension cords with 3-pronged plugs. Exception: Extension cords for use with appliances and tools that are "double-insulated."
- ⌚ Completely connect plugs. Push them in all the way. *Do not plug one extension cord into another.*
- ⌚ Unwind cord before using. Do not use if damaged. Do not cover or walk on cords.
- ⌚ Never leave an open line (no product plugged into the end of an extension cord while it is plugged into an outlet). Not even for a minute. Always unplug cords not in use.
- ⌚ Never leave extension cords outside in the snow or very cold weather for extended periods.
- ⌚ Replace outdoors extension cords every three or four years if damage is noted.

Match each outdoor electrical product to its extension cord:

- ⌚ Match power needs ([amperage](#)) of electrical products with [amperage rating](#) of extension cords.
- ⌚ The extension cord capacity should be as high as or higher than that of the electrical product attached to it. [Amperage ratings](#) for outdoor electrical products can range from "1 A" for a bug killer to "15 A" for a snow blower and are found on nameplates attached to products. Compare them to the rating information on extension cord packaging and on labels permanently attached to cords.

To convert [amps](#) to [watts](#), multiply by 120 [volts](#). For example, 10 A x 120 V = 1200 W.

Match the extension cord [gauge](#) to the [amperage rating](#) of the product. AWG on the above label stands for American Wire Gauge. Cords for outdoor use are generally either 12 AWG (heavy) or 14 AWG (medium).

ELECTRICAL LAWN & GARDEN PRODUCTS

Follow every general safety rule for outdoor electrical products when using electrical lawn and garden products. Then take some extra precautions.

Lawnmowers and other lawn and garden equipment with sharp blades and rapidly moving parts can cause serious injury by cutting off a finger or a toe. **Never remove the guards.**

Keep children well away from lawnmowers and other products, which can throw objects such as rocks and sticks.

Products like power shovels or diggers, lawnmowers, mulchers, tillers, thatchers and leaf or snow blowers move and have moving parts that can cut, burn, even blind when directions are not followed. Study each product's manual for safe operation rules.

Mowing a lawn:

- ⓘ Clean area first; remove rocks, branches, wires, bones or other foreign objects that can be thrown by blades.
- ⓘ Avoid wet grass.
- ⓘ Mow only in daylight.
- ⓘ Always wear enclosed shoes.
- ⓘ Never remove safety guards or adjust wheel height while motor is running.
- ⓘ Keep cords out of working path.
- ⓘ Avoid loose clothing and jewelry that can catch on moving parts.
- ⓘ Keep bystanders, especially children away.
- ⓘ Push, don't pull. Mow across not up and down slopes.
- ⓘ Clipping, trimming a hedge or edging, wear safety goggles or other protection recommended by the manufacturer. Never overreach especially when on a ladder.
- ⓘ Avoid power lines. Contact can cause serious injury or death.

Use these accident-prevention techniques:

- ⓘ Keep your equipment in good operating condition.
- ⓘ Blocked snow or leaf blower: Unplug the power cord for these electric appliances (or turn the engine off for gasoline-powered products) before attempting to clear the obstruction. To clear out the blockage, use a stick long enough to protect your hands from injury. Never put your hand near the collection or discharge chutes. Even when the engine is off, blades can remain spring-charged, resulting in swift movement when its path is cleared. **Extra precaution is always wise.**

Ladders and electricity do not mix.

Electrocutions (an average of 12 over the last three years according to the U.S. Consumer Product Safety Commission) can happen when metal ladders are used near overhead wires to clean gutters, paint houses, trim trees and repair roofs and chimneys or install outdoor antennas.

- ⓘ Use only a fiberglass or wooden ladder if you must work near overhead wires and do not let it come into contact with the wires.
- ⓘ If you must use a metal ladder, keep it well away from overhead lines.

- ⓘ If a ladder starts to fall into an overhead line, let it go! Stay nearby while someone else calls the power company to cut off electricity to the line before you touch or move the ladder that is in contact with a power line.
- ⓘ Never touch a person who is holding a ladder that has fallen onto a power line. Use something that does not conduct electricity, such as a long piece of dry wood or rope to push or pull them loose.

BATTERY-OPERATED PRODUCTS

Follow the same safety rules with cordless, battery-operated products as any other electrical product. Batteries generate electric power. Read and follow manufacturer's instructions.

Some special things to remember when using battery-powered products:

- ⓘ Keep batteries away from children.
- ⓘ Cordless products, since they don't have to be plugged in, are always ready to use. Store them away from children or inexperienced persons.
- ⓘ Bring cordless products indoors overnight so they won't be subjected to a higher moisture level or a sudden rainstorm.
- ⓘ Remove batteries or lock switches in "off" position when not in use before changing accessories or cleaning battery-operated products to prevent accidents while your hands are near blades or other moving parts.
- ⓘ All batteries should be replaced at the same time. Do not mix fresh and discharged batteries or battery types.
- ⓘ Ensure batteries are installed correctly in device and charger with regard to polarity (+ and -).
- ⓘ Do not use cordless tools near gaseous or explosive materials. Sparks from their motors might cause fires or explosions.
- ⓘ Never **short circuit** batteries as this may lead to high temperatures, leakage or explosion.
- ⓘ Never attempt to disassemble batteries as this can lead to electrolyte burns.

Things to remember when recharging batteries:

- ⓘ Always recharge battery-operated products with the charging unit and procedure recommended by the manufacturer.
- ⓘ Recharge products in a dry place away from radiators, heaters, stoves, flames or chemicals.
- ⓘ Plug charger directly into an electrical outlet, never into an extension cord.
- ⓘ If your product battery does not recharge properly, first check the trouble section of your instruction manual. Next, take the product and the charger to a manufacturer-recommended repair center.
- ⓘ Replace batteries only with recommended size and type to insure compatibility between rechargeable battery and charging circuit.
- ⓘ Never attempt to recharge primary batteries as this can cause them to leak, cause a fire or explode.

Take these precautions with extra batteries:

- ⓘ Do not expose batteries to moisture, frost or temperatures over 110 degrees or under 20 degrees F. Do not store in refrigerator or freezer. If batteries get cold; bring them to room temperature before use.
- ⓘ Do not store batteries touching metal objects such as wire, nails or coins (in your pocket). Such contact can cause a large current flow, possibly leading to burns or fire.

And for safe battery disposal:

Batteries and battery packs can explode in a fire. Follow manufacturer's instructions for disposal.

POWER TOOL SAFETY

Power tools are often used out of doors or in a garage or shed where the door should be open for adequate ventilation, especially when sanding. The same rules apply to them as to other electrical products used outdoors and then some. Power tools require skilled use. Operators should not only read but also memorize the product instruction manual.

Power tools should never be used when children are in, or even near, the work area.

Power tools should always be:

- ⌚ Held by the insulated gripping surface to avoid electrical shock.
- ⌚ Used with safety goggles and other safety gear: a face shield, dust mask, hard hat, ear protection, gloves or safety shoes as recommended by the manufacturer.
- ⌚ Used with a GFCI, either permanently installed or a plug-in type.
- ⌚ Plugged into a three-pronged outlet known to be **grounded**, unless they are double insulated. Used with a three-wired extension cord, if needed.
- ⌚ Used in a dry area away from explosive fumes (gasoline or naphtha), dust or flammable materials.

Power tools should never be:

- ⌚ Used while wearing loose clothing or jewelry that can get caught in a moving part.
- ⌚ Used near live electrical wires or water pipes, especially when cutting or drilling into walls where they could be accidentally touched or penetrated.
- ⌚ Used after they have tripped a safety device such as a GFCI. Take the tool to a manufacturer-authorized repair center for service.
- ⌚ Used when you are upset, angry or in a hurry.
- ⌚ Used without guards or with an extension cord longer than 100 feet.

Other outdoor electrical products such as fans, bug killers, holiday or party lights, heaters, music systems, power paint rollers, barbecue spits and many more each have manufacturer-recommended precautions included in the instructions that are packaged with them. Take time to read and follow instructions. Here are a few reminders:

Power washer-This product uses water with electricity. Make sure you read the directions carefully.

Barbecue grill- Read directions to find out if it can be stored outdoors or used on an apartment balcony, patio or deck. Also check with your apartment building manager for usage rules and/or local ordinances or regulations.

Charcoal igniter-Do not store outdoors.

GLOSSARY

Amperage (amps) - A measure of electrical current flow.



Arc-fault circuit interrupter (AFCI) - Protection from fires caused by effects of electrical arcing in wiring. AFCI device will de-energize the circuit when an arc fault is detected.

Circuit breaker or fuses - Protect against over current and short circuit conditions that could result in potential fire hazards and explosion.

Electrical faults - A partial or total failure in an electrical conductor or appliance.

Energized - Electrically connected to a source of potential difference, or electrically charged so as to have a potential different from that of the ground.

Gauge - Standard or scale of measure.

Ground-fault circuit interrupter (GFCI) - Protection against shock and electrocution. GFCI device will de-energize a circuit when it senses a difference in the amount of electricity passing through the device and returning through the device, or a "leak" of current from the circuit.

Grounded/grounding - A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth, or to some conducting body of relatively large extent that serves in place of the earth.

Over current - Any current in excess of the rated current or ampacity of a conductor. May result in risk of fire or shock from insulation damaged from heat generated by over current condition.

Outlet - A contact device installed along a circuit for the connection of an attachment plug and flexible cord to supply power to portable equipment and electrical appliances. Also known as receptacles.

Three-pronged plugs and outlets - Protect against potential shock from the use of damaged products or electrical power cords designed to take stray electrical current safely to ground.

Short circuits - An abnormal electrical path.

Voltage (volts) - A measure of electrical potential.

Wattage (watts) - A measure of the rate of energy consumption by an electrical device when it is in operation.

Compliments of:

Electrical Safety Foundation International

1300 N. 17th St., Suite 1847

Rosslyn, VA 22209

Phone: 703-841-3229/Fax: 703-841-3329

E-mail: info@esfi.org

Web: www.electrical-safety.org