



ELECTRIC
SAFETY
AT HOME



Electricity powers our lives. From keeping the refrigerator running to operating our lights and computers, electricity provides a reliable, consistent source of power for the things we use every day. Electricity can also be dangerous. Properly maintaining the electrical systems in our homes is critical for our safety. This book covers the basics of electrical safety, including information about what to do if a storm or other disaster causes damage to power lines or other electrical systems.

One simple step to increasing your family's safety is to install smoke alarms and carbon monoxide detectors throughout the home. The National Fire Protection Association (NFPA) recommends a smoke alarm inside each bedroom, outside sleeping areas, and on every level of the house. Carbon monoxide alarms should be in a central location outside sleeping areas and on every level of your home. Check your state and local building codes and laws for any requirements about placement of carbon monoxide alarms and smoke alarms.



LICENSED ELECTRICIANS ARE LICENSED FOR A REASON.

- Licensed electricians have been properly trained, have passed a test to demonstrate their knowledge, and know the electric codes for your area.
- They are also insured (liability and workers' compensation).
- Licensed electricians can identify and correct defects in wiring, especially defects that might cause electrical contact and injury or fires.

DON'T JUST TAKE THE ELECTRICIAN'S WORD FOR IT.

You can confirm that your electrician is licensed by calling the Code Enforcement Office. If your state regulates licensure at the state level, call the state office number to verify your electrician's license. If your state issues licenses at the township level, confirm licensure with the local code enforcement office.



HAZARDS

FIRE

Follow these safety guidelines in the event of an electrical fire.

- Call 911 and let them know it is an electrical fire.
- Don't throw water on an electrical fire. Because water conducts electricity, using water to put the fire out could lead to electric shock. Instead use a fire extinguisher approved for Class C (electrical) fires. For a small fire, use baking soda.
- Don't touch an appliance that is smoking or on fire. Unplug it or turn off the power to your house using your circuit breaker.
- FEMA recommends following the five second rule. If you can't put out the fire within five seconds, immediately leave the house and call 911 from a cell phone or a neighbor's house. Let them know it's an electrical fire.



ELECTRIC SHOCK

The Centers for Disease Control recommends the following steps if you believe someone has been or is being electrocuted.

- Look first. Don't touch. The person may still be in contact with the electrical source. Touching the person may pass the current through you.
- Call or have someone else call 911 or emergency medical help.



- Turn off the source of electricity if possible. If not, move the source away from you and the affected person using a non-conducting object made of cardboard, plastic, or wood.
- Once the person is free of the source of electricity, check the person's breathing and pulse. If either has stopped or seems dangerously slow or shallow, begin cardiopulmonary resuscitation (CPR) immediately.
- If the person is faint or pale or shows other signs of shock, lay the person down with the head slightly lower than the trunk of his or her body and the legs elevated.
- Don't touch burns, break blisters, or remove burned clothing. Electrical shock may cause burns inside the body, so be sure the person is taken to a doctor.

ELECTRICAL SYSTEM

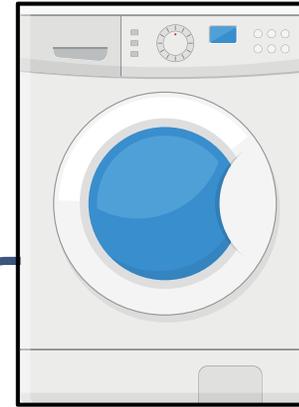


The electrical system is the series of connected wires, breakers, circuits, and connections in your home. Electricity is typically delivered by underground or overhead wires to a breaker box with a main breaker to power the entire home. To stay safe, it is important to understand the different components of your home's electrical system and identify and repair any problem areas.

The breaker box is the central hub for electricity in your home. Residential circuit breakers and fuses are rated by size with smaller breakers (120 volts) powering lighting and small appliances. Large breakers in the home (240 volts) are typically designated for large appliances or central air conditioning. It's important to accurately label your fuses and circuit breakers. It will make it easier to find the right breaker when working on your home. More importantly, labeled circuit breakers are a valuable resource for fire fighters responding to an electrical fire.

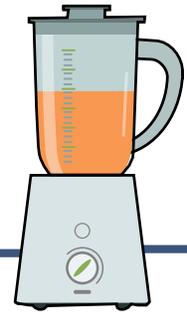
Electricity travels through the home from the breaker box along circuits. When you turn on a light or plug in a device, it completes the circuit and electricity can flow through. Typically electricity flows through on a black or red wire and returns on white wire. A bare or green wire will serve as a ground wire, which is a safety check on the system. If the circuit overloads and trips the breaker, the circuit wires heat up, tripping the circuit breaker and shutting off the flow of electricity.

HOW ELECTRICITY MOVES THROUGH YOUR HOME



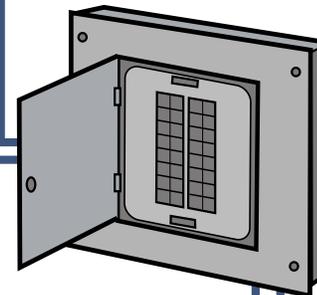
240V CIRCUIT

Some of the electricity in your home goes through 240-volt circuits. Typically this will be a dedicated line for one large appliance like a clothes dryer or air conditioner.



120V CIRCUIT

Most of the electricity in your home goes through 120-volt circuits. This includes your lights, TV, and other small appliances. If you try to run too many appliances off of one circuit, the circuit breaker may switch off automatically to prevent overheating and fire.



BREAKER BOX

Electricity comes into your home from outside power lines here, then goes out the rest of your house.

OVERLOADING CIRCUITS



You plug in your space heater on an especially cold night, and a moment later the lights go out and the space heater stops working. You've just overloaded the circuit by asking the circuit to power more devices than it can handle. The breaker in your breaker box sensed the overload and tripped, breaking the circuit of electricity.

There are warning signs that your circuit is overloaded. If you see flickering lights or feel a warm plug, it's likely you are overloading a circuit.

If you want or need to install an appliance in a part of your home that doesn't have enough capacity on the circuit, you may need to call an electrician to install a new circuit. A good example of this would be adding a wall air conditioning unit to a part of the house that didn't have one before.

Before adding new appliances, calculate whether your circuits can handle them. Multiply the number of amps that the circuit is rated for by the voltage (120 volts for most of the house, 240 volts for circuits going to large appliances like refrigerators). This will tell you how many watts your circuit can handle.

A 15-AMP CIRCUIT X 120 VOLTS = 1800 WATTS.

APPLIANCE	WATTS
Hand Blender	150 watts

CAUTION

NEVER TRY AND CIRCUMVENT AN OVERLOADED CIRCUIT BY PUTTING A PENNY IN THE CIRCUIT OR REPLACING A BREAKER WITH A HIGHER AMP ONE. CIRCUITS AND BREAKERS ARE DESIGNED TO WORK TOGETHER. MIXING AND MATCHING THEM COULD CAUSE A FIRE.

GROUND FAULT CIRCUIT INTERRUPTION

You might have seen outlets in kitchens with two little buttons in the middle. Those are Ground Fault Circuit Interruption (GFCI) outlets. There is always a risk for electrical shock in wet locations such as kitchens, bathrooms, garages, or outside. GFCI outlets sense the difference between the amount of electricity entering a circuit with the electricity leaving it. If they are not equal, the GFCI shuts off electricity. For example, if you come in contact with water while using an appliance, the electrical current can flow through your body and into the ground. This creates a disparity in the amount of electricity flowing back to the circuit, which would trigger the GFCI to immediately shut electricity off so you don't get electrocuted.

TEST YOUR GFCI OUTLETS

It's important to test your GFCI outlets regularly to make sure they are working properly. An easy way to do this is with a night light. Plug in the night light and press the test button. It should go out. When you press the reset button, the night light should go back on. If your GFCI is not working properly, it's important to have it inspected by an electrician.



EXTENSION CORDS

POWER STRIPS

& MULTI-PLUG DEVICES



We all need extension cords and power strips from time to time. We have drills that need to reach a bit farther than their cords or a media center with a few more devices than the outlet on the wall has room for. It's important to think about safety when choosing and using power cords, extension cords, and multi-plug devices. Using them incorrectly could create a fire, electrocution, or burn hazard.

EXTENSION CORDS

- Choose a cord based on where you will be using it. Outdoor cords are designed to handle weather and guard against shock. Never use an indoor cord outside.
- Don't overload your cord. Plugging in a tool or appliance that uses more power than the cord is rated for could cause a fire. For large appliances like air conditioners, freezers, or space heaters, purchase a special heavy duty extension cord.
- Don't keep extension cords under a rug or carpeting. This can cause the cord to overheat and create a fire risk.
- Don't daisy chain cords (plugging multiple extension cords together).
- Check cords frequently for damage. Discard damaged cords or have them repaired by a licensed electrician.
- If the cord feels hot, immediately stop using it and throw it away.
- Do not run extension cords across walkways where they could present a trip hazard.

POWER STRIPS

- Make sure not to overload power strips. Power strips are designed for light-use appliances like computers and alarm clocks, not heavy appliances like A/Cs or coffee makers.
- Do not plug a power strip into an extension cord. Invest in a power strip that is long enough for your needs.
- Don't daisy chain power strips.
- Regularly inspect power strips for damage and replace any that show signs of wear.

SURGE PROTECTORS

Power surges can be caused by storms or by running equipment like refrigerators, dishwashers, and power tools. When surges happen day after day, they can damage sensitive electronic equipment over time. Surge protectors stop voltage spikes from damaging electronics by diverting excess energy into an electrical ground.

Pick the surge protector for the amount of energy it can absorb with a joule rating of 600 or higher. And keep in mind that as surge protectors absorb power spikes over time, their capacity diminishes. If you know your surge protector has absorbed a major power spike, you should consider replacing it. Also pay attention to your surge protector's lights. Most protectors have lights to indicate that they are functioning properly.

In addition to surge power strips, you can also purchase a whole house surge protector that is wired to the main service panel. Whole house surge protectors should only be installed by licensed electricians.



OUTSIDE

POWER LINES

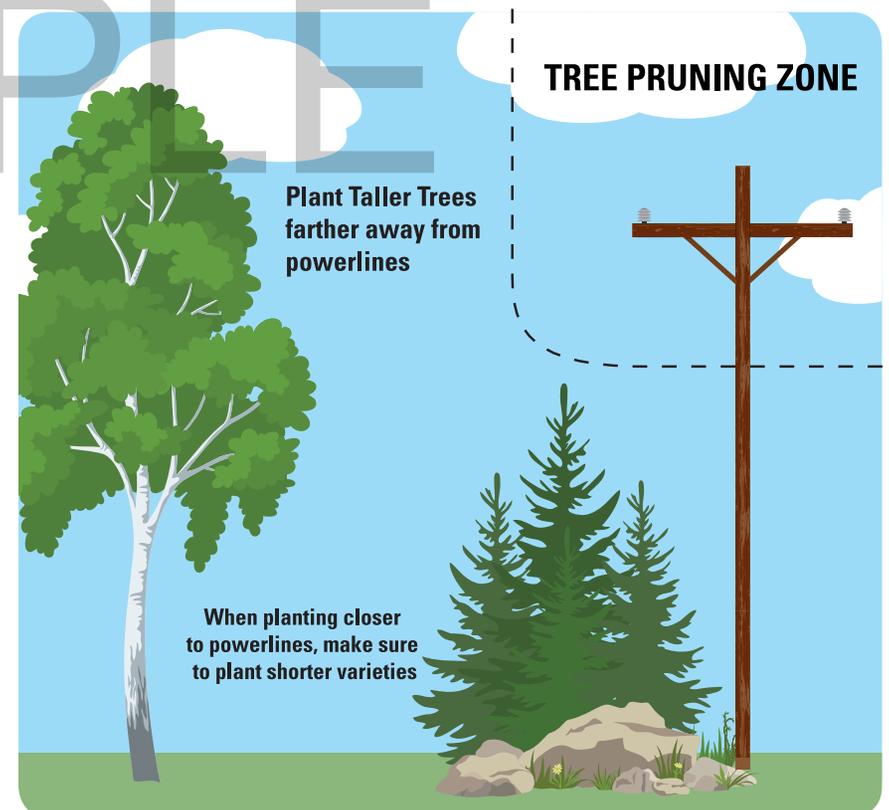
- When working outside, be conscious of where power lines are. If you're trimming trees or cleaning out your gutters, make sure to keep a safe distance from power lines. Keep tools at least 10 feet away from power lines, as power can "arc" or jump to the tools or equipment.
- Don't fly kites, drones, or model airplanes near power lines. If a kite gets stuck in a power line or a tree near a power line, call your utility company. Don't try to remove it yourself.
- Avoid putting ladders up near power lines. When carrying ladders, hold them horizontally.
- Power lines are sometimes buried underground. Call 811 before you dig to find out if there are any lines buried on your property.
- Talk to your kids about safety around power lines. Make sure they know to not play near them and to never climb a utility pole.



TREES AND PLANTS

- Trees that come in contact with power lines can become energized and become an electrocution or fire risk. If you see a tree in contact with a power line, call your utility company.
- Never trim branches near a power line yourself.
- When planting new trees, research the tree varieties to make sure they won't grow into your power line. If a tree is too close to a power line, call your utility company.
- When planting near pad-mounted transformers (often known as the big green boxes), make sure to pick plants that won't grow to a size that will obstruct the transformer. Call your utility company before planting, as there will be buried wires near the transformer.

PLANT TREES IN THE RIGHT PLACE



GENERATORS AND BACKFEED



Safely installed generators can be an important backup during outages. It's important to find the generator that suits your household's needs. Consider the following to help you find the right home standby generator:

1. Frequency and duration of outages
2. Household makeup – Are there special needs occupants who rely upon caregivers, medicines, etc.?
3. Do occupants work at home? What are energy requirements needed?

Ensure that you buy a model that will supply enough power for your intended emergency use. Generator purchases may seem like a good idea until you realize that the wattage is often insufficient to run furnace fans, stoves, refrigerators, and other devices. Generator vendors, such as hardware and big box stores, can help you determine the recommended generator capacity.

If you want to set up a generator system, make sure you hire a licensed electrician to install a transfer switch. Transfer switches fall into two main classifications:

- Portable generators use a Manual Transfer Switch (MTS), meaning that you have to manually turn your generator on and connect it to the transfer switch if the power goes out. You also must fill portable generators with gasoline every few hours.
- Standby generators use an Automatic Transfer Switch (ATS), meaning that the generator comes on automatically if the power goes out. Standby generators run on propane or natural gas and are connected to existing gas lines.

Why bother with transfer switches? Using transfer switches prevents backfeed, which is when electricity flows back to the power lines from your generator. Backfeed is extremely dangerous, as it energizes outside power lines in contact with fences, trees, etc. Utility workers and neighbors may suffer a deadly electric shock if they come into contact with energized objects.

When using a portable generator, make sure you turn off the main breaker to ensure that electricity doesn't backfeed power to downed power lines.

Always connect a generator through a transfer switch. Never try to backfeed your house through the dryer outlet or any other outlet. Doing that can backfeed the power lines, and you could be found liable if someone was hurt or killed.

CARBON MONOXIDE

To avoid the risk of carbon monoxide poisoning, portable generators should always be run outdoors, at least 25 feet away from your home.

It's important to install carbon monoxide detectors in your home. This odorless gas is deadly and can also be produced by defective heaters, stoves, and other appliances.

KNOW SYMPTOMS OF CARBON MONOXIDE POISONING

Symptoms include dizziness, headache, nausea, irregular breathing, and confusion. If you think you have the flu but get better when you leave the house, carbon monoxide could be the cause.



KIDS

Don't forget to teach your children about safety with electricity and electrical equipment. These simple safety steps will help keep your children safe.

SAFETY STEPS

- Consider installing tamper-resistant receptacle (TRR) outlets in your home. TRRs look like regular outlets but feature spring-loaded cover plates that block the outlet openings. These plates only open when equal amounts of pressure are placed on both sides—not from small objects a child may stick into a slot.
- Put plastic caps over unused outlets. Children are still able to remove most of these caps, so they don't provide a substitute for TRR outlets or keeping an eye on the child.
- Install fire and carbon monoxide detectors and test them monthly.

SMOKE DETECTORS

Make sure to have smoke detectors in every bedroom and on each floor of your home.



TEACH CHILDREN

- Do not stick anything in an electric appliance or outlet.
- Keep electrical appliances away from water. Do not use appliances near sinks, bathtubs, or pools.
- Do not pull on power cords.
- Do not climb power lines or climb near power lines.
- Do not fly kites or drones near power lines, and do not try to retrieve them if they get stuck.
- Avoid substations and transformer boxes.
- Know what to do in case of a fire.

BALLOONS

Metallic balloons, also known as mylar balloons, conduct electricity. If they fly into a power line or substation, they can cause a surge of electricity that can lead to a fire or power outage. Always secure mylar balloons by tying them to a weight or structure. If one gets caught in an electric line, don't try to retrieve it yourself. Call your utility company. When you are done with the balloon, make sure to deflate it so it doesn't accidentally fly out of your trash can.





POWER OUTAGES

Power outages are a rare occurrence, but one that you should be prepared for. Make plans to ensure your family's comfort and safety. Blackouts can happen anytime from equipment failure, grid outages, or storms. If the power goes out, first turn off all electronic items. Unplug TVs and computers. Leave one light on so you know when the power is back on. The Federal Emergency Management Agency (FEMA) recommends keeping an emergency kit ready at all times. See the next page for a packing list so you can make your own.



IF DAMAGE IS MINIMAL/NON-EXISTENT

- Ensure family members and pets are safe.
- Turn the lights on and reset clocks.
- Call your insurance company if storm damage has occurred.
- Hire licensed contractors to make repairs if necessary.

IF DAMAGE IS SIGNIFICANT

1. Ensure family members and pets are safe.
2. Take photographs of damaged possessions for insurance purposes. Mitigate/address the damage, which will demonstrate that you did everything possible to save your possessions.
3. Hire a licensed disaster recovery service if possible and licensed contractors to make repairs. If you can't hire a disaster recovery service, consider the following:
 - a. Clean all hard surfaces with a 10 percent bleach solution.
 - b. Remove soaked drywall before mold develops.
 - c. If there is flooding, follow FEMA directions concerning "soft" furniture (mattresses, sofas, etc.) Typically, this furniture grows bacteria and becomes unsafe. You may want to discard the furniture.
 - d. Very few electronics and appliances are rated to survive being soaking wet, even briefly. Plan on replacing any electrical equipment and appliances.

FEMA

EMERGENCY KIT

CHECKLIST



- Water: one gallon of water per person per day for at least three days, for drinking and sanitation
- Food: at least a three-day supply of non-perishable food
- Battery powered or hand crank radio and a NOAA Weather Radio with tone alert and extra batteries for both
- Flashlight and extra batteries
- First aid kit
- Whistle to signal for help
- Dust mask to help filter contaminated air and plastic sheeting and duct tape to shelter-in-place
- Moist towelettes, garbage bags, and plastic ties for personal sanitation
- Wrench or pliers to turn off utilities
- Can opener for food (if kit contains food)
- Local maps

ADDITIONAL ITEMS TO CONSIDER ADDING TO AN EMERGENCY SUPPLY KIT:

- Prescription medication and glasses
- Infant formula and diapers
- Pet food and extra water for your pet
- Cash or traveler's checks
- Important family documents such as copies of insurance policies, identification and bank account records in a waterproof, portable container
- Cash or traveler's checks and change
- Emergency reference material such as a first aid book or information from www.ready.gov
- Sleeping bag or warm blanket for each person (consider additional bedding if you live in a cold-weather climate)
- Complete change of clothing including a long sleeved shirt, long pants, and sturdy shoes. Consider additional clothing if you live in a cold-weather climate.
- Household chlorine bleach and medicine dropper (9:1 water to bleach as a disinfectant or 16 drops of pure, unscented bleach to a gallon of water to treat water in an emergency)
- Fire extinguisher
- Matches in a waterproof container
- Feminine supplies and personal hygiene items
- Mess kits, paper cups, plates and plastic utensils, paper towels
- Paper and pencil
- Books, games, puzzles, or other activities for children



DOWNED POWER LINES

If you see a downed power line or a power line that is sagging in an unusual way, call your utility company immediately.

Stay at least 35 feet away from downed power lines. Electricity can travel through the ground. Always assume lines are energized even if they “look” de-energized. Note that coated wires for telephone and cable carry voltage too and can electrocute you.

Don't try to move a downed wire. All coatings and coverings degrade over time, which means you can be electrocuted if you grab the wire to move it.

Don't go near anything touching a downed wire. Downed wires can also energize structures they contact, including trees, fences, cars, playsets, and outdoor furniture.



Don't go close to water that is near a downed wire. Puddles, streams, and other bodies of water can become energized. Be careful after storms around streams or other sources of water in case a wire has fallen in them.

De-energized lines can become re-energized: even though a line may not be carrying electricity at the moment doesn't mean it won't become re-energized. Show the same caution around a downed power line whether it's energized or not.

If a power line falls on your car because you were driving in a storm or you got into a car accident and crashed into an electrical pole, it's critical that you know how to stay safe. You are safest while still in your vehicle because the electricity travels through the metal of your car through your tires to the ground. The ground around your car could be electrified.

- Don't get out of the car unless there is a fire. The outside of the car and the ground around it may be energized. Wait for emergency responders.
- Call 911 and tell them that a power line is on the car.
- Warn others not to approach the car. Bystanders may try to help, but they could put themselves in danger of electrocution.
- If you can drive safely, drive at least 35 feet away before getting out of the car. Immediately call 911 to report the accident and downed line.

IF YOU MUST LEAVE YOUR CAR BECAUSE IT IS ON FIRE OR THERE IS ANOTHER LIFE-THREATENING SITUATION:

- Do not touch the car and the ground at the same time.
- Jump out of the car with both feet together. This way, there won't be a voltage difference between your feet that could create a circuit and allow electricity to flow through your body.
- Shuffle or hop slowly away from the car, keeping your feet together until you are 35 feet away.

RESOURCES



Electrical Safety Foundation International
www.esfi.org

National Fire Protection Association
www.nfpa.org

Department of Homeland Security's Ready Campaign
www.ready.gov

Centers for Disease Control and Prevention
www.cdc.gov/disasters/

Federal Emergency Management Agency
www.fema.gov

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