Reed College Occupational Health and Safety Committee Presents

Your Health, Your Safety: Our Concern

Nothing's Shocking

Electricity Revealed

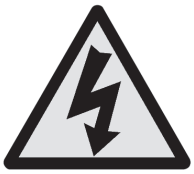
January 0000

What's the Buzz?

Electricity is all about electrons: subatomic particles

that carry a negative charge. Electrons "stick" to materials known as electrical insulators—things like wood, glass, plastic, ceramic, and air. These materials do not conduct electricity. However, most metals are good electrical conductors. They have free electrons that can detach from their atoms and move around, allowing electricity to pass through freely.

AC/DC: Electrical current is measured in the number of electrons moving (amperage or current) and the pressure pushing the electrons along (voltage). Moving electrons have energy, which can be harnessed to do work. In the US, home power outlets are 120 volt, 60-cycle AC (alternating current) power—meaning the direction of the current reverses 60 times a second. Batteries and solar cells use DC (direct current) power. This type of power utilizes fixed positive and negative terminals that keep the current flowing in the same direction.



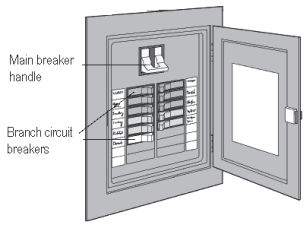
Power to the People: Electric companies use AC power. They do so because this power can be distributed efficiently through the use of transformers. When AC power is distributed, a smaller wire can be used than for DC power. The smaller the wire, the less energy lost during transmission, meaning lower overhead costs.

Home Security

Home is where the heart is...and the cat, the kids, the housemates, etc. In this section we cover some safety features of your home and good practices for keeping it protected.

When There's No More Power: What do you do when the power goes out? First things first, check your fuse or breaker box to see if you have any blown fuses or tripped circuits. If they're okay, check if your neighbors have power. If the problem isn't with the circuits, call your electric company to report the outage (PGE's outage reporting number is 503-464-7777 or 800-544-1795). Next, turn off all of your appliances, including your water heater, electric furnace, stove, any washers or dryers, stereo and television to help prevent overloading the system when power is restored (major appliances can be turned off at the circuit breaker). The waiting is the hardest part, but do be sure to call your electric company again if your neighbor's power is restored and yours is not.

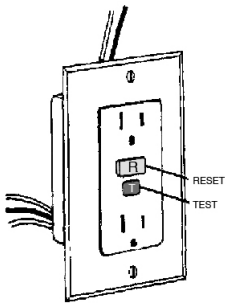
Breaking Up: An important electrical safety feature of your home is the circuit breaker. When electrical wiring in a building has too much current flowing through it, these machines cut the power until the problem can be repaired, thus preventing fires and other electrical problems. If you have a problem, and need to turn off your electricity, start by finding your circuit breaker. Flip every branch circuit breaker (the ones in rows below the main breaker) to the off position. Only after flipping all of the circuits off should you flip the main breaker handle. Best do this with a flashlight.



Fuse Control: The simplest circuit protection device is the fuse. Fuses protect wires. They break the circuit if a problem arises, saving wires from burning out. To change a fuse, first check to see if all the appliances on the circuit are off. Grab a flashlight and head to the fuse box. Before changing the fuse, look down and *make sure you are not standing in a puddle*; throw down a rubber mat or a wooden plank if it's wet. Use the proper size and type of fuse for the circuit—fires can result from the wrong size fuse. A 15 amp fuse is appropriate for lighting and outlet circuits; larger appliances require higher rated fuses. Fuses marked "P" or "D" are heat sensitive and will blow if there is overheating on the panel board. This is a good thing—it decreases the possibility of a fire in the fuse box. Use D fuses (time delay or dual element) for circuits with motorized appliances and use P fuses for circuits with appliances that are heated

but non-motorized. Once you've got the right fuse in the right circuit, screw the fuse in tightly.

Less Shock & Awe: Those who like to live on the safe side may consider installing ground-fault circuit interrupters (GFCIs) in all home outlets. Most places where you're more likely to get shocked, such as the bathroom, are constructed with a GFCI in the outlet. If there is a "Reset" button and a "Test" button between the two plugs, then that outlet has a GFCI. In a wall outlet, the left vertical slot is larger and is "neutral", the right slot is "hot", and the hole below them is the ground. A GFCI monitors the electricity flowing from hot to neutral. If there is an imbalance, even a very small one of 4 to 5 milliamps, the GFCI trips the circuit. This prevents shocks. The GFCI will also cut the power when electricity is flowing to you instead of the neutral.



The Firestarters: Just a little awareness and maintenance are all you need to cut down the risk of an electrical fire. Pay close attention to the warning signs your home gives you—flickering light bulbs, sparking, frequent circuit tripping, and frequent light bulb burnouts. If you have any doubts, cut the circuit in question and call a professional. Make sure your plugs and extension cords aren't overloaded. Replace old, frayed cords and any cord that is warm to the touch. When you do electrical home-improvement projects, take special note of wire gauges, loose connections, and device ratings. Last but not least, do not bypass a burnt-out fuse with a penny—that fuse blew for a good reason!

Physiological Effects

A 1 second shock from a range of currents:

1 milliamp (mA): makes you tingle
5 mA: maximum harmless current
10-20 mA: start of the "cannot let go" current, with sustained muscular contraction
100-300 mA: ventricular fibrillation (cardiac "quivering"), fatal if continued
6 Amp: sustained ventricular contraction followed by normal heart rhythm, temporary respiratory paralysis, burns

Shocking, Isn't It?

Every year thousands of people are treated for electrical shock injuries, resulting from their consumer products. Around 300 people a year in the US die from electric shock out of 120V and 277V circuits. You don't need to touch a power line for a shock to be fatal.

Firefighting: Put out electrical fires with CO2 fire extinguishers, *not water,* and turn off the main power source. If the fire is large, evacuate the area and call 911.

First Aid for Shock Victims: If someone is being shocked, do not touch them—you might get shocked too. Turn off the main power supply. Try not to touch any burns or blisters on the victim and do not remove any clothing.

For a severe electrical shock (500V or more), go to an emergency room or call 911 immediately. For less severe shocks, call a doctor if any of the following are true:

- Person was shocked unconscious
- Shock victim is pregnant
- There is numbness, tingling, paralysis, vision, hearing, or speech problems
- 5+ years since the last tetanus booster
- The burns are not healing well

SOURCES:
www.esfi.org/index.php
www.usfa.dhs.gov/safety/tips/electrical.shtm
www.redcross-pdx.org

American Red Cross

ESFi Electrical Safety Foundation International