



Electricity

Scouts BSA · STEM

Name

Started

Completed

Electricity powers almost everything around you. In this badge you'll learn how it works, how to stay safe around it, and how to build simple projects of your own. You'll also see how your home's electrical system and bill work.

Requirements

Every official requirement, in plain language. Check the official wording when you sign off (scouting.org/merit-badges/electricity/). Tips and examples are ideas, not extra requirements.

1 Responding to electrical emergencies

Tips for this section: Learn the first rule: never touch someone who is still in contact with live electricity. Practice what you would do and who you would call.

Example for this section: Walk through it with a parent: if someone is touching a live wire, don't touch them. Shut off power at the breaker if you can, call 911, and only use something dry and nonconducting, like a wooden broom handle, to separate them if it's safe.

- ☐ **1a** Explain how to shut off power to one circuit and to the whole house in an emergency

- ☐ **1b** Demonstrate how to rescue someone at home who is touching a live wire

- ☐ **1c** Describe how to get out of a car safely after a crash if a power line may be lying on it

- ☐ **1d** Show first aid for someone knocked unconscious by what seems to be an electric shock

- ☐ **1e** Show how to treat an electrical burn

- ☐ **1f** Explain what to do if there's an electrical fire

- ☐ **1g** Explain what to do if you're caught out in the open during a lightning storm

- ☐ **2** Inspect your home for electrical safety using the checklist from the merit badge pamphlet or one your counselor approves, then discuss the results with your counselor

Tip: Walk through your home with a parent looking at cords, outlets, and overloaded power strips. Write down anything that needs fixing.

Example: A home inspection checklist: frayed or pinched cords, cords under rugs, power strips plugged into power strips, outlets near water without GFCI protection, and light bulbs over the fixture's wattage. Share your list with your family.

☐ **3** Build a simple electromagnet and use it to demonstrate magnetic attraction and repulsion

Tip: Wrap wire around an iron nail and connect it to a battery with an adult's help. Test it with paper clips and another magnet.

Example: Wrap 20 to 30 turns of wire around an iron nail and connect a battery with an adult. Count how many paper clips it lifts, then add more turns and count again. Use a compass or bar magnet to show both ends attract and repel.

4 Kinds of current and power sources

Tips for this section: Compare the batteries in a flashlight with the outlets in your wall, and look up how power plants, solar panels, and batteries make electricity.

☐ **4a** Explain how direct and alternating current differ, the pros and cons of each, and a practical use for each

☐ **4b** Explain three ways electricity is generated

☐ **5** Draw a simple diagram of how an electric bell works with a battery, and describe what each part does

Tip: Use a library book or a cutaway diagram to sketch the inside of a battery and a bell, then explain each part in your own words.

6 Overloads, fuses, and breakers

Tips for this section: With a parent, look at your home's breaker panel or fuse box, but don't open it. Talk about what happens when too much is plugged in.

- ☐ **6a** Explain what it means to overload a circuit and what you've done to keep your home's circuits from being overloaded

- ☐ **6b** Check whether a branch circuit is overloaded, either by finding the current draw of everything plugged into it or by calculating the draws with the power equation

- ☐ **6c** Explain why fuses blow and circuit breakers trip

- ☐ **6d** Tell how to locate a blown fuse and a tripped breaker in your home, and show how to reset the breaker safely

- ☐ **7** Draw a floor plan wiring diagram of one room in your home showing its lights, switches, and outlets and which fuse or breaker protects each

Tip: Pick one room, find its breaker, and sketch the outlets, switches, and lights. Label which switch controls what.

Example: Pick your bedroom. Flip the breaker off with a parent and test which outlets and lights go dark. Draw them with standard symbols and label the breaker number and amp rating.

8 Electric bills and saving energy

Tips for this section: Find the meter reading on your last bill, then read your meter today to see how much you've used since. Look over the other charges on the bill and brainstorm ways to save.

Example for this section: If your last bill shows a reading of 34,112 and your meter reads 34,540 today, your home has used 428 kilowatt-hours since that bill. Multiply by the rate on your bill to find the cost, then talk about ways your family could save, like LED bulbs or unplugging chargers.

- ☐ **8a** Read the meter tied to your electric bill and work out how much power has been used since the bill and what it costs

- ☐ **8b** Explain any other charges on the bill that are taxes or fees

- ☐ **8c** Talk with your counselor about five ways your family could save energy

9 Electrical terms and equipment

Tips for this section: Make flash cards for terms like volt, amp, ohm, and watt. Quiz yourself until they stick.

- ☐ **9a** Explain these terms: voltage, current, resistance, power, and energy

- ☐ **9b** Explain these units: volts, amperes (amps), ohms, watts, and watt-hours

- ☐ **9c** Explain these electrical conditions: ground, open circuit, short circuit, overvoltage, potential difference, and a generating source (with an example)

- ☐ **9d** Explain what each of these is and how it's used: conductor, insulator, circuit, Ground Fault Circuit Interrupter (GFCI), surge protection, rheostat, rectifier, inverter, transformer, substation, transmission and distribution systems, solar panel, and wind turbine

10 Hands-on electrical projects: Choose 2 of 6

Tips for this section: Choose projects that interest you and always work with low voltage and an adult nearby.

Example for this section: Two projects might be a simple motor from a kit your counselor approved ahead of time, and two bulbs wired first in series and then in parallel so you can see how the brightness changes. Use batteries, and have an adult check your work before you switch it on.

- ☐ **10a** Wire a buzzer, bell, or light to a battery with a key or switch in the circuit

- ☐ **10b** Build and run a simple electric motor (a kit is fine if your counselor approves it in advance)

- ☐ **10c** Build a simple rheostat and show that it works

- ☐ **10d** Build a single-pole, double-throw switch and show that it works

- ☐ **10e** Explain how a 3-way switch is wired in a lighting circuit

- ☐ **10f** Wire two lights in series with a battery and a switch, then rewire the same circuit in parallel, and discuss how the two circuits differ

- ☐ **11** Name three careers that use knowledge of electricity; for one of them, research its training, education, certification, experience, and costs, plus job outlook, starting pay, and advancement; discuss with your counselor what you learned and whether the career interests you

Tip: Talk with an electrician, engineer, or utility worker about their job and how they trained for it.