

Let's Learn About Electrical Safety Outdoors

Teacher's Guide

INTRODUCTION

Let's Learn About Electrical Safety Outdoors is a coloring and activity book designed to educate young children about electricity and the potential hazards it poses for some types of outdoor activities. In reading the book and doing the exercises, children learn basics about electricity, how it is transmitted to homes, and what potential electrical dangers they should stay away from when they are outside. In addition, the back cover of the booklet teaches students how to recognize and respond to natural gas leaks.

This discussion guide contains background for teachers, followed by questions for each page in the booklet that you can discuss with students, as well as further suggested activities that can be done in class or as homework. You can do as much as you wish in one lesson and then continue the rest in other lessons.

Activity answers – See back cover of booklet for all activity answers.

DISCUSSION TOPICS & SUGGESTED ACTIVITIES

Cover

Ask students these questions:

- What activities does it look like the kids on the cover want to play? (*Fly a kite, play soccer, play Frisbee.*)
- What do you think the Safety Bears in the hard hats might be telling them? (*It can be dangerous to play ball or Frisbee, or fly a kite around overhead power lines, or near transmission stations. It's important to learn how to stay safe around these hazards.*)

Page 2 – Electricity from Power Lines

Ask students these questions:

- Where is electricity produced? (*Power plants.*)
- How does the electricity get to our homes? (*Overhead and underground power lines.*)
- Ask students to describe where in the picture these two types of lines are. Have them color the overhead lines red, the way the underground lines are.

Suggested activity: Have students color the rest of the drawing as you provide some or all of the following background about electricity.

Teacher Background: Electricity

Most electricity used in the U.S. is produced at power plants, using a variety of energy sources, such as coal, oil, natural gas, nuclear or solar power, water, or wind.

High-voltage electricity leaves the power plant and travels long distances over transmission lines on tall towers. Electricity loses some of its strength as it travels, so it must be helped along by transformers that boost or “step up” its strength or voltage.

When electricity gets closer to where it will be used, its voltage must be decreased. Different kinds of transformers at utility substations do this job, “stepping down” electricity’s power. Electricity then travels on smaller overhead or underground distribution wires to neighborhoods. When the distribution wires reach a home or business, another transformer, usually on a power pole, reduces the electricity down to just the right voltage to be used in appliances, lights, and other things that run on electricity.

A power line called a service drop carries the electricity from the distribution wires to the house and connects to wires running through the walls to outlets and lights. Electricity is always waiting in the wires to be used. Electricity travels in a circuit. When you switch on an appliance, you complete the circuit. Electricity flows along power lines to the outlet, through the power cord into the appliance, then back through the cord to the outlet, and out to the power lines again.

Page 3 – Electricity Helps Us

Ask students what activities electricity enables them to do at home and at school.

Suggested activity: Ask students for input while you list on the board the things they have in their homes or things in the school that use electricity. Point out what an amazing and valuable thing electricity is in our lives.

Page 4 – Electricity Can Hurt You!

Ask students these questions, and then have them figure out the hidden message:

- Why is the Safety Bear holding the kids back? (*The wire carrying electricity to the lamp is frayed.*)
- What travels through the wires? (*Electricity.*)
- Why is a frayed wire dangerous? (*If you touch it, you could get a shock.*)

Explain to students that by its nature, electricity seeks the easiest path to the ground. It will travel through any conductive material available. Human beings conduct electricity because we are 70 percent water, and water is a great conductor. If you get between electricity and the ground or something touching the ground, electricity will flow through you. A person climbing in a tree or standing on the floor is connected to the ground and can still be shocked.

Emphasize to students that an electrical shock can be quite serious. People who are shocked can be burned internally and externally. A shock hurts a lot. It can cause internal burns, stop your heart, or even kill you.

Page 5 – Stay Away from Power Lines

Ask students these questions:

- Why do you think it is unsafe to climb utility poles? (*Utility poles are not always insulated, and if you touch the pole you could become the electricity’s shortest path to the ground.*)
- Why is it unsafe to play near power lines? (*If you touch a power line while standing on the ground or when hanging from something resting on the ground, like a tree or ladder, you could give electricity a path to the ground and get shocked.*)
- Why is it dangerous to fly kites near electric lines? (*If the kite goes into the lines while you’re holding it you could get shocked.*)

Page 6 – Downed Power Line

Ask students these questions:

- Why is it dangerous to go near a fallen electrical wire? (*It can shock you.*)
- Whom do you think the Safety Bear is calling on the telephone? (*911 or an adult.*)
- Whom should you ask an adult to call if you see a fallen power line? (*911 or the local electric utility.*)
- Why should you stay away from fallen power lines? (*They can hurt you.*)

Suggested activity: Have students color the picture while asking if anyone has ever encountered a downed power line before. If they have, what did they, or the adult they were with, do? Have the students act out a telephone call to the utility company reporting a downed power line.

Page 7 – Stay Away from Substations

Ask students these questions:

- Why should you stay away from substations and utility towers? *(They contain electrical equipment that is dangerous to touch.)*
- Where have you ever seen a substation in your town or city? *(Answers will vary.)*

Suggested activity: Have students draw a warning sign on the substation fence. While they do so, explain to students the following.

Most power lines are not insulated and are located underground or high overhead to prevent accidental contact. However, substations, pole-mounted transformers, and pad-mounted transformers may attract curious children. The danger of shock is high near any of this electrical equipment. Warn children that they should not climb substation fences or power poles, or fly kites near them.

Page 8 – Insulators Keep Electricity Where It Belongs

After students connect the dots, ask them these questions:

- What is the purpose of insulators? *(To keep electricity from traveling down power poles.)*
- What is the Safety Bear telling the boy not to do? *(Throw a rock at the insulators.)*
- Why is it unsafe to throw something at an insulator? *(If the insulator is damaged, the electricity could travel down the power pole and hurt somebody if they touch it.)*

Page 9 – Pole-Mounted Transformers

Ask students these questions:

- What is the Safety Bear pointing at? *(A pole-mounted transformer.)*
- Why should you stay away from these? *(The danger of shock is high near pole-mounted transformers and substations.)*

Page 10 – If Your Kite Gets Caught

Ask students these questions:

- What has happened outside? *(The boy's kite has gotten caught in the power line.)*
- What is the Safety Bear doing? *(Calling for help.)*
- Who should be called in this kind of situation? *(911 or the local electric utility.)*
- What is the most important safety message to remember in this situation? *(Do not touch any part of the kite.)*

Page 11 – Keep Away from Pad-Mounted Transformers

Ask students these questions:

- Why is the Safety Bear telling the children to stop playing Frisbee? *(They are near a pad-mounted transformer.)*
- Why is it dangerous to play near a pad-mounted transformer? *(These are high-voltage and could cause shock if touched.)*
- What is the safe thing to do in this situation? *(Find another area to play in.)*

Page 12 – Matching

Review with students where they would find each of the items pictured: insulator *(on a utility pole)*; pad-mounted transformer *(on the ground)*; pole-mounted transformer *(on a utility pole)*; substation *(fenced, in a neighborhood)*.

Suggested activity: Ask students to see if they can locate any insulators or pole-mounted or pad-mounted transformers near their school or in their neighborhood at home. Ask them to remember that they should never play near any of these, and should warn their friends and family about these as well.

Page 13 – Underground Power Lines

- What is the boy in the picture doing? (*Digging a hole to plant a tree.*)
- Why is the Safety Bear rushing to tell him to stop? (*He needs to have an adult call the local utility locator service first.*)
- What is the danger in this situation? (*There could be buried underground power lines, and if he strikes them, he could get shocked.*)
- What do you think a utility locator service would do? (*Determine if and where the underground lines are, so the boy would know where it's safe dig the hole for the tree.*)

Suggested activity: Ask students to color the buried electric line orange or red. Ask them why you chose those colors. (*Because they carry electricity, which can burn or shock.*)

Page 14 – Where Can We Climb and Play?

Ask students these questions:

- Where do you think it is safest to play? (*A playground, because there should be no electrical hazards.*)
- Ask them to describe each of the three pictures that show unsafe places to climb, and why it is not safe. Pad-mounted transformer (*It is high-voltage, and has a "Keep Out" sign*). Tree with wires through it (*If they climb or hang from a tree that is touching wires, they could become part of the electricity's path to the ground, and be shocked*). Substation (*It contains dangerous equipment and is fenced off*).

Page 15 – Follow the Safe Route

Ask students if they think they will be more aware of potential dangers when they are out walking.

Page 16 – Back Cover

Ask students to share with their parents and families what they will do if they see any of the hazards listed in their neighborhood.

Ask students the following questions:

- Have you ever smelled leaking gas in or around your home?
- What are the other signs that indicate a gas leak? (*Hissing sound; dirt being blown into the air; continual bubbling in a pond, creek, or river; plants that seem to be dead or dying for no reason.*)
- What should you do if you do smell the rotten egg smell, or see any of the other signs listed that indicate a gas leak? (*Don't use electricity or fire. Leave the area and do not go back. Ask a trusted adult to call 911 and PG&E immediately.*)

Suggested activity: Write this list on the board or post it on the bulletin board and keep it there for a week or two as a reminder to students of what they've learned. Or ask student to create their own lists, with a border and pictures, to take home and post in a prominent place.

Teacher Background: Gas Pipeline Safety

Natural gas is a fossil fuel used for heating, cooking, and producing electricity. A colorless and odorless gas, it is lighter than air. Most of the natural gas we use today has been formed over millions of years as ancient plants and animals died and were buried under sand and mud in swamps, lakes, or oceans. As they decayed, the gas was trapped under layers of solid rock. Natural gas is found in the same underground areas where crude oil (petroleum) is found.

There are about one million miles of underground steel pipeline carrying natural gas throughout the U.S. Regulator stations control how much gas is pumped into smaller pipes that lead to homes, businesses, and factories. A chemical called *mercaptan* is added to the natural gas to make it smell like rotten eggs. We use natural gas in our homes by burning it in our furnaces for heat or hot water, or sometimes for other appliances such as stoves, ovens, and clothes dryers. When natural gas leaks, there is a risk of fire and explosion.