Did you drink a glass of water today?

Walk by a construction site?

Ride on a highway?

Civil engineers help make those things possible.

Look around your house. The faucet is connected to water systems that engineers designed. Walk outside. Civil engineers make the buildings safer, design roads and even the streetlights that light your way. Engineers are always thinking of new ways to improve our lives.
How can that building be standing? Even odd-shaped buildings can stand when civil engineering genius is at work!

Paper Power

Figure out how to make a flimsy sheet of paper hold a bunch of books at least 1 inch above a table.

Building Materials
• one sheet of ordinary paper
• 2 or 3 small books (or 1 really big book)

Build It!
Wait! Get your brain going first. Think of some design ideas and draw pictures of them. But you can’t use tape or staples. (Hint! Crease, Crumple, Roll, Fold, and Tear. Changing the shape of paper can increase its strength—a lot!) Now, pick your best idea and build it!

Did it work? Was your structure strong enough to hold the books? No? Then, don’t give up. Think of a new design and try it out. Engineers do that all the time. They come up with lots of ideas, test them one at a time until the problem is solved. With a real building, engineers figure out how many support beams to use and where to put them. They use computer models to test an make sure the beams will support the structure. Civil engineers also design fun things like roller coasters and waterslides. Find out how at www.discoverengineering.org/coolstuff.asp

Tasty Engineering
Make these delicious treats and explore how engineers make structures strong and stable.

A “Boring” Sandwich
The ground that a building is built on is as important as how strong the building is. Civil engineers must make sure the ground is solid enough to hold a structure. They make holes in the ground, called borings, to get soil samples for testing: what it’s made of and how loose, wet, or sandy it is. Then engineers design the structure stronger or compact the soil, if needed.

Make Edible Borings. Here’s how: Make a balogna & cheese sandwich. Push a clear plastic drinking cup, open end down, into the sandwich stack. Take it out. Can you see the “layers” of the sandwich? What do they look like? Now, eat your snack.

What other “soft” food ingredients can you use to make a "boring" sandwich?
Dollar Bill Stand

Make a dollar bill stand up. Then challenge your friends and family to do it.

Edible Concrete

Okay, this recipe is not really concrete, but you CAN eat it.

Crush one graham cracker to make crumbs. Put the crumbs into a plastic or paper cup. Add one teaspoon of powdered sugar to the cup. Mix graham crackers and sugar. Stir in 1–2 teaspoons of unfrozen orange juice concentrate and 1/2 teaspoon of corn syrup. Mix the ingredients together. The mixture should be slightly moist. Press the “concrete” to the bottom of the cup with a spoon or your fingers. Turn the cup over and tap the bottom to remove the "concrete" cookie. Go ahead and eat your cookie. Try different molds for the cookie, or different types of cookies and juice, like ginger snaps or vanilla wafers, or grape juice.

Standing Strong

Every day, about 50 earthquakes occur worldwide. Yumei Wang, a geotechnical engineer (a type of engineer), makes sure schools, hospitals, and other buildings can withstand earthquakes. Yumei works in Oregon with a team of architects and structural and construction engineers. They look at a building’s shape and design (a cube is often the safest), the building material (wood, brick, concrete), and the type of ground it stands on (sandy, rocky, or wet). Then buildings are judged for sturdiness. If a building receives a low score, the team recommends ways to strengthen it. Yumei has screened over 100 buildings!

Why It’s Called Edible Concrete

Concrete is a key building material. It strengthens foundations and covers all kinds of structures. More than 6 billion tons are used in the U.S. every year. Real building concrete uses a type of recipe similar to the one for your cookie. Concrete is made of portland cement, an aggregate (the combination of two materials like gravel and sand), and water. In the edible concrete cookie, the graham cracker crumbs are the aggregate. The powdered sugar is the portland cement. The orange juice concentrate and corn syrup represent the water.
**Down the Drain**

Every time you flush your toilet, about 4 gallons of water go down the drain. That’s a lot of water! Have you ever wondered where it goes? What happens to it? Most wastewater goes to treatment plants that are, you guessed it, designed by civil engineers. At the plant, solids and pollutants are removed. Then the water is returned to local waterways or used to water parks and golf courses, or for industrial purposes. But don’t worry, it’s not used for drinking. Whew!

**Build a wastewater treatment system that cleans all the gunk (well, most of it!) out of water.**

**Building Materials**
- scissors
- 2-liter soda bottle, cut in half crosswise (have an adult cut it for you!)
- cotton balls
- napkins
- cup of dirty water (add dirt, gravel, small pieces of paper, cooking oil, and even food coloring if you want to)

Put the top half of the soda bottle upside down (like a funnel) inside the bottom half. The top half will be where you build your filter (a screen that catches some of the parts that make up your dirty water). The bottom half will hold the filtered water.

**Think about** how to arrange the materials to make a good filtering system. What will catch the different materials? Build the filter. Pour your dirty water through it. Hey, is the water cleaner? Take the filter apart and look at the different layers. Can you tell what each material removed from the water?

Redesign your filter and see if you can get the water cleaner.


**Oh, My Aching Back**

In Inhambane, Mozambique’s people walk up to five hours a day to get water. Millions of people around the world haul their daily water from streams, rivers, or wells and it can be full of deadly bacteria. But your tap water is safe. It’s filtered and purified to kill disease-causing bacteria. What’s it like to carry water over distances?

**Try This**

Fill two empty gallon-sized milk jugs with water. Now carry them up and down the stairs 3 times, 5 times, 10 times - if you can. Bet that was hard! A gallon of water weighs about 8 pounds. Thanks to civil engineers, all you have to do is push a button or turn a knob to get your water!

**Amazing Water Facts!**

The average American household uses about 100,000 gallons of water a year. If you took a bath every day in a full tub of water, it would take you 3,000 days or about 8 years to use 100,000 gallons of water.

**Drinking Money**

In the U.S., 1,000 gallons of bottled water costs about $4,000. 1,000 gallons of tap water cost $1!

**Check out these resources:**
- Those Amazing Engineers by Charlotte Forbes
- See what different kinds of engineers do

www.asce.org/kids/

Fun activities and information on civil engineering