



SWEducational

ACTIVITY PACKET

Architectural and Civil Engineering Edition

WHAT IS ARCHITECTURAL AND CIVIL ENGINEERING?

Civil engineers design, build and maintain anything that is built in our environment. This includes the roads and bridges we drive on, the canals and dams that control our water, and even buildings and airports.

Architectural engineering is also known as building engineering, it bridges the gap between two kinds of jobs - architecture and engineering. Architectural engineering involves the planning, design, construction and operation of buildings.

IMPORTANT TERMS

Earthquake Shake Table: machine that moves back and forth with a building or other structure on top of it

- Example: Engineers may put a design of an office building on a shake table, then see how large of an earthquake it can handle.
- In this activity you will be pushing your towers back and forth like a shake table would.
- Why is it important for engineers to use a shake table before using their designs on real buildings?

Stability: the ability for something to keep its shape and stay upright

- Example: A tent that is anchored into the ground is more stable than one that is not.
- You will need to think about what will make your structure more stable in this activity.
- Can you name some ways that you can make your structure more stable? (You can use this question to help with your design brainstorming!)

Elasticity: how well something can stretch

- Example: Elasticity is very important when it comes to designing for earthquakes. During an earthquake, a building will need to be elastic to bend back and forth with the earth's shaking.
- In this activity, You can think of pushing your structure back and forth as a mini-earthquake.
- What are some other ways to prepare people for earthquakes?

Failure: the point when an earthquake causes damage to a structure

- Example: A building on a shake table that begins to crack would be experiencing failure. Shake tables often test buildings until failure to see how large of an earthquake the structure could handle.
- If your structure begins to break when you shake it, you've found it's failure point. Then, you'll be able to try again to build a stronger structure!
- What are some qualities of a building that could change how big of an earthquake it can handle? (Hint: Look at the other important terms!)

ACTIVITY INSTRUCTIONS

Today you will be making an earthquake proof tower! You will experiment with different designs to discover what tower has the most stability. Remember that failure in engineering is good because you get to learn how to make your design even better!

SUPPLIES

- Before collecting supplies, double check with an adult that your materials are okay to use! For this activity you can use whatever you can find in your house. The only goal is to make a stable tower! Some examples of materials are:
- Cardboard or cereal box
- Paper
- Paper Towel or Toilet Paper Tubes
- Tape or Glue
- Straws
- Popsicle sticks
- Recycled tubes, boxes, or food containers
- Whatever else you can find!



STEPS

1. Start with a base using the cardboard or cereal box.



2. Use any of the other materials to build a stable tower. Make sure that your tower is securely fastened to your base. Below are some examples of structures you can try!



3. Once you have built your tower slowly push the base to simulate an earthquake. If your tower does not fall push the base a little faster. Then keep pushing it faster and faster to see how big of an earthquake your tower can withstand. Remember is it okay if it falls!



4. After you have tested your first design try a new design and see if that tower works better in an earthquake. You can make as many as you want! The more you make, the better your designs will get. Try and come up with more materials and designs you can use to make the best earthquake proof tower!



OTHER LINKS AND VIDEOS

- What is Architectural Engineering Video:
<https://www.youtube.com/watch?v=YLjqlj7qAr8>
- Crash Course Video - Civil Engineering:
<https://www.youtube.com/watch?v=-xbtnz4wdaA>
- Fun civil engineering games and activities to try out:
https://www.asceville.org/just_for_fun.html
- PBS interactive architectural engineering games:
<http://www.pbs.org/wgbh/buildingbig/skyscraper/challenge/index.html>
<http://www.pbs.org/wgbh/buildingbig/lab/index.html>

CAL POLY ENGINEER SPOTLIGHTS



LEXI

Hello! I am a second year Architectural Engineering student. I love ARCE because I get to work with lots of different fields such as engineering, architecture, and construction, which are all things I am interested in. I also hope to one day get to study sustainable architecture such as using green energy like solar power and recycled and sustainable materials! ARCE is really cool because we get to learn all about the inside structure of a building and all the things you need to keep people safe. The coolest project I have done so far was called Design Village where groups of students get to design, build, and sleep under your very own structure.



LAUREN

Hi! I'm a first year Civil Engineering major. Civil Engineering is what I love to do because I can make cities better for the people living in them. This could be anything from making there be less traffic on the road to helping water get to different buildings. Civil Engineers can also pick an aspect of the city that they want to specialize in. I am really interested in specializing in transportation, and would love to help people get to where they want to go quickly. During an internship, I got to work on detour plans for helping cars avoid crashes on the highway and still be able to get to their destinations.



WILL

I love Civil Engineering because I know that everything I make will improve people's lives. I specifically love doing transportation. In transportation, I get to design the roads all of us drive and rely on. I get to work on solving traffic, making people's drives quicker and safer, and I get to work on making towns more beautiful and friendly. I also get work on interesting problems that have a ton of different solutions that will have a big impact on people's lives. I love Civil Engineering and transportation and cannot think of doing anything else.