Minds in Motion

Skyline Structures

What's The Plan?

Engineers have to think about lots of different things when building a tall *Structure*. What materials they can use, what challenges might be in the environment, and what the *Structure* might be used for. You'll take on the role of an Engineer and *Prototype* a tower for a client!

What You'll Need:

Here's a list of everything you'll need! Don't have something exactly? Get creative! Some of our suggested swaps are listed in Grey.

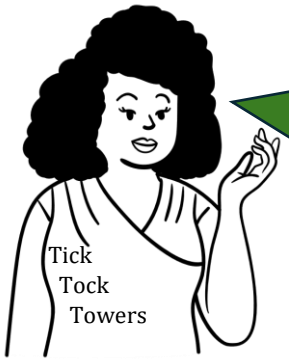
- 10 Pieces of Dry Spaghetti | Craft Sticks, Skewers, Sticks
- 6 Marshmallows | Piece of Clay or Playdough, Sticky Tac

What To Do:

1. Pick your Client

We're hoping to reach a wider audience, but to do that we need a taller *Radio Tower*! It has to come to a single point on top too! Oh! And we think it should be on the top of the tallest mountain, but be careful, it can get really windy up there!

Metropolis is growing, and we want to create a tourist experience! We're thinking about a tall *Observation Tower* that overlooks the whole city and has great views all the way around. Lots of people should be able to hang out at the top of the tower! Be careful though, the city is known for earthquakes!



We're in the business of helping folks keep time! Could you build us a large rectangular *Clocktower* that can hold a big clock face? It would be awesome if the clock could be seen from almost anywhere. There are some train tracks near the base though, so the ground shakes all the time!

We've noticed a lot more boats fishing around the rocky coast. The wind is really strong there and we want to make sure sailors know where the coast is. Can you create a big *Lighthouse* for us, making sure that it could hold a big light and the worker can move around?

Did you hear Metropolis just passed 1 million residents? We want to build a tall, decorative *Monumental Tower* to celebrate! We think it should be an interesting shape, and strong enough that nothing will ever knock it down! We don't need people to go inside it, but that might be cool!

2. Set some Project Limits:

Perfect Project:	Crunch time:	Material Delay:	Rushed Project:
Take all the time you'd like and use any materials you can find. This can make for some tall towers! This rarely happens in real life!	Uh oh! The project is running late! You can use as many resources as you can find, but you only have 10 minutes to build your tower!	Your materials never made it, but the project must continue! Take as much time as you'd like, but you can only use half your available materials!	You're missing materials and you're running out of time, what will you do? You have 10 minutes to create your tower and can only use half of the materials available to you.

3. Make a plan:

Draw, Describe or Describe your idea. How will you use your materials, or make sure your tower stays standing? Maybe you'll use some *Strong Shapes*?

4. Get Building!

Remember your project limits and the challenges from your client.

*We recommend connecting the spaghetti pieces by poking them into the marshmallows, but you can experiment and find what works for you!

5. Test your Tower:

Time to show your prototype tower to the client and see what they think! Here are some tests you can try, See if your tower can last at least 10 seconds in each test!

i. Gusts of Wind: Use a piece of cardboard or paper to create wind gusts. Hold it in both hands and wave it up

and down quickly to 'fan' your tower without touching it.

ii. Shaking Ground: Place your tower on a towel or blanket on the floor. Using both hands, gently move the towel in small left and right movements on the ground, causing your tower to shake.

6. Redesign:

How did your prototype do? Was there anything you think you could improve on? Maybe a *Truss* to help out? Spend another 5 minutes reinforcing your tower.

7. Test Again:

Repeat your first test, was your tower strong in different ways this time? You can repeat the redesign and testing process as many times as you'd like! This is part of the *Engineering Design Process*!

8. Tidy up!

Don't forget to clean up your workstation so it's ready for you next time!

What Are We Talking About?

Here is a list of important words we use during the project!

- *Structure:* A structure is any thing that is made up of many different things. Bridges, houses, schools and towers are all examples of structures!
- *Prototype:* A prototype is the first model of a new creation, these aren't usually perfect, but can be used to test something before you create it for real!
- *Communication Tower: These towers help send and receive invisible waves that we see or hear as TV, radio, texts, phone calls and more.*
- *Observation Tower:* Built for looking at nice views or keeping an eye on things, these towers help humans get above everything and see cities, nature and more!
- *Clock Tower:* Clock towers are usually found in important places in cities. They feature a large clock or bell and help nearby residents tell the time!
- *Lighthouse:* Often found by the sea, these towers help ships travel safely near shallow or rocky waters.
- *Monumental Tower:* Some towers are built to remember important events or people. One of the main jobs of these towers is to look good!
- *Strong Shapes:* Some shapes are naturally stronger than others. A triangle for example, is strong because it's equal sides can support each other, and it doesn't change shape easily. Some shapes, like squares or rectangles, can be made stronger by adding *Trusses.*
- *Truss:* When we add supports to the inside of a square structure, turning it into two or more triangles, we call those supports trusses.

- *Engineering Design Process:* This is a helpful tool for planning engineering projects.
    - You start by **Defining** the problem, then **ask** a whole bunch of questions about the problem. Now that you know what you're trying to solve, you can start brainstorming as many solutions as you can!
    - Next you **Imagine** the possible solutions you came up. How do they work in your imagination? Could that happen in the world today? Keep imagining solutions until you discover the one you think is the best possible solution for now.
    - Now it's time to **Plan** and **Prototype** your favourite idea, first, break your solution into steps that you can work through, then get to work on those steps building your prototype!
    - **Test** your prototype! Watch what happens and notice when it is or isn't what you expected!
    - Finally, **improve** your prototype! You can keep rebuilding your prototype better and better after each test. The best engineering projects have several prototypes first!

How Did It Go?

We'd love to hear about all the amazing STEM projects you're doing! Show us your finished projects on any of the following social media platforms by tagging us!

Twitter: @MyMindsInMotion
Facebook: @mindsinmotion2014 || @ucactiveliving
Instagram: @ucalgaryactive

SCAN ME

Let us know how you felt about the project! Please click here or scan the QR code above to fill out a short survey!