

## Engineering

### Slender Tower Challenge

Build a tower to match your height with the smallest footprint.

#### DESIGN CHALLENGE

Materials;

Tape measure or ruler, 1 pair of scissors, 10 sheets of paper, (If possible, reuse scrap paper instead of using brand-new paper) 1 roll of tape

Choose an open area to build your tower so you can take a selfie photo with you standing next to your tower. What challenges might an engineer face in building a tall building? (Support, weight, wind, etc.) What makes a building “slender”? (Width-to-height ratio.) What unique challenges do we face in making a tower slender? Think about the pros and cons of different building methods, like rolling, folding, and so on.

Draw a quick sketch of what you plan to build and think about where to use the tape and how (using it to strengthen the paper and/or to connect each piece of paper to the next).

Measure the widest part of the base and the tower’s height.

*Footprint: The area taken up by a building’s base. Slenderness ratio: The ratio of a skyscraper’s width to its height. Engineers consider buildings “slender” if they have a width-to height ratio of at least 1:10 or 1:12*

*Action-*

E-mail [dan.wiggins@highbury.ac.uk](mailto:dan.wiggins@highbury.ac.uk) a photo of you standing next to your tower along with the width of the base and the height. Share your observations as you built your tower.

## **Engineering Connections**

Think about the tallest building you have ever seen. What did it look like? Did you wonder whether it was going to fall over? You probably didn't, but that is something that engineers must consider very carefully when designing skyscrapers or tall, slender buildings. Engineers who design buildings are called structural engineers. They work hard to solve problems, just as you did with this challenge. They have to think about what type of building is needed, how much space they have to build it, what types of materials are available, how to anchor the building to the earth, and how much time the design and construction will take. They also need to be sure that their skyscrapers will be safe and sturdy and be able to stand up to high winds. Cities are always growing and changing. To keep up with these changes, engineers develop new and stronger building materials. They also create new, modern, beautiful designs for buildings.

## **Science Connections**

Did you know that skyscrapers move? That's right: they move! Imagine a giant tree in the wind. To avoid breaking in strong winds, it sways. That is, it moves a bit with the wind without ever leaving its spot in the ground. Skyscrapers must be built to stand up to strong pushes from the wind, as well as other pushes and pulls, or forces, that occur during earthquakes, for example. These tall, slender buildings are designed to move just a little bit so that they don't break. They don't move enough that you would notice it if you were standing in the building—it's just an inch or so—but it's enough to help strengthen the skyscraper in rough or windy weather. Another way that these buildings keep their balance is through their base, or foundation, which works like the roots of the tree to anchor it to the ground. Try standing on one foot and swaying a little bit. It's pretty tough, right? Now try it on two feet. It's likely much easier. It's the same idea with skyscrapers: having a larger base that is firmly

attached to the earth will help to support a tall building, even when it gets pushed around by wind, storms, or even earthquakes

