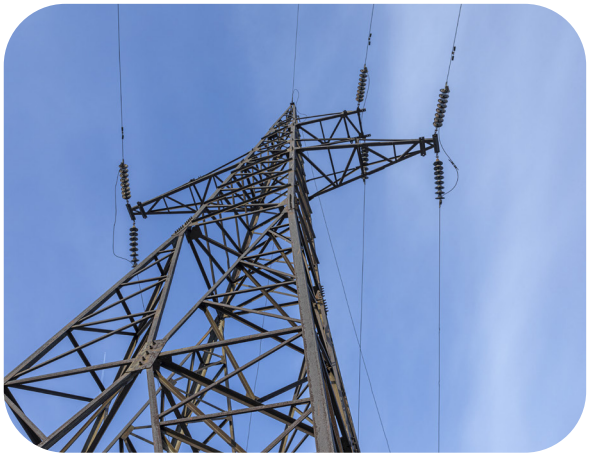
THE REZOURCE FORCE

DESIGN & BUILD
Tower Challenge



Transmission Towers

Electricity doesn't just appear in your home, it travels hundreds of kilometres from where it's made to where it's used. That's thanks to tall structures called transmission towers. They hold up the heavy transmission lines that carry electricity from where it's generated to where we use it.

In this challenge, you'll become an engineer and design your own transmission tower. It needs to be tall, strong, and capable of carrying a "powerline" and a small weight without collapsing!

The Challenge

Work in a team to design and build a tower using only tape and A4 paper that:

- ✅ Can support a can of food
- ✅ Is as tall as possible
- ✅ Uses the least amount of paper possible

Based on the "Tallest Paper Tower Challenge" by Science Buddies:

Finio, B. (2022, December 20) https://www.sciencebuddies.org/science-fair-projects/project-ideas/CE_p027/civil-engineering/tallest-paper-tower-challenge

Rules

- The tower must be built only from paper and tape.
- You may fold, roll, cut, or bend the paper in any way.
- The tower must be freestanding. It cannot be taped to a wall, chair, or person.
- The base can be taped to the table or floor but not to any vertical surface.
- The tower must hold the testing weight for at least 1 minute without falling.
- The weight must rest freely on the tower (no taping it to the top).
- Only the materials used in the final design count toward your total.
- Your teacher may give you a time limit to design, build and test your tower.

Materials

You may only use the materials listed below.
If you're comparing results with other groups, stick to the same limits.

Construction Materials

- Up to 30 sheets of A4 printer paper
- One roll of masking tape at 2.4 cm wide
- Clear tape, masking tape, or painter's tape only. No duct tape, double-sided, or packing tape.

Tools

- Scissors
- Ruler
- Pencil
- Metric tape measure or metre stick
- Heavy object for testing (e.g. a 400–450g food can or paperweight approved by your teacher)

Transmission Tower

Scoring

To be successful in this challenge, your tower must not only support the required weight, it also needs to be efficient. Use the least amount of paper you can without making your tower too weak. The goal is to design a tower that is both tall and efficient with the use of materials.

To determine your team's score, towers will be judged and ranked using this equation:

Height of tower (cm) – (2 × number of paper sheets used)

1. Research

Before you build, take time to learn how real engineers design tall, stable structures. These ideas will help you plan a tower that's both strong and smart. You can research them online, look them up in a book, or discuss them as a class. Here are some key engineering concepts to kick-start your research:

Truss
A truss is a strong shape made by connecting triangles together. In your paper tower, using trusses can help spread weight and make your structure stronger without using too much paper.

Compression
A force that pushes parts of a structure together. The legs of your tower will be under compression as they support the weight above.

Tension
Tension is a pulling force. In your tower, tension might happen in parts that stretch across or help keep the structure from pulling apart.

Load
The total weight your tower needs to hold, including its own weight and the heavy object placed at the top. Your design must handle this load without collapsing.

Base Support
The bottom of your tower. A wide, stable base helps stop your tower from tipping over and spreads the load across the ground.

Height-to-Base Ratio
The relationship between how tall your tower is and how wide the base is. Tall towers with narrow bases are more likely to fall. Finding the right balance is key.

2. Design

Before you start building, spend some time planning your design. Your tower should be as tall as possible, but remember you'll be scored on both height and how many sheets of paper you use.

This means a slightly shorter tower that uses less paper might score higher than a taller one that uses lots of sheets. Your challenge is to find the right balance between strength, height, and material use.

Sketch your ideas first. Try drawing different tower shapes and thinking about how you'll build them. Which shapes are strongest? Which designs use less paper? You can fold, roll, bend, and cut the paper, but try not to waste it.

Sketches don't count toward your paper total.

Transmission Tower

3. Build

Once your team agrees on a design, begin building.
You may want to practise building small parts, like rolled columns or triangle bases, before assembling the whole tower. Test strength as you go.

Engineers don't always get it right the first time. If your tower doesn't hold or collapses early, identify the problem, fix it and rebuild. That's part of engineering.

4. Test

When your tower is complete, it's time to put it to the test.

- Place the can (or other approved weight) on top of your tower.
- Your tower must support the weight for at least 1 minute without collapsing.
- You cannot touch, fix, or support the tower during this time.
- If your tower passes, measure its height from the ground or table to the bottom of the can in centimetres.
- Count how many sheets of paper your final tower used.
- Then, work out your score using the formula:

Score = Height of tower (cm) – (2 × number of paper sheets used)

Extension

Work with another team to build a pair of towers that can hold a length of string stretched between them—just like real transmission towers carrying a powerline. Then test your towers by:

- Hanging a weight from the middle of the string (e.g. a flat washer, paperclip, or small bag of rice).
- Making sure the weight hangs freely without touching the ground.
- Ensuring both towers remain upright and stable for at least 1 minute.

6. STEM Expo

It's time to share your work at the STEM Expo! Your team will present your final tower and explain your design process. Choose a simple way to communicate your thinking. This could be a short presentation, a poster, or even a quick video. Your Expo presentation should include:

- **The height of your final tower**
- **How many sheets of paper you used**
- **Whether your tower held the weight**
- **A sketch, photo, or labelled diagram of your final design**
- **One thing you'd keep and one thing you'd change**

During the Expo, you could also run a friendly competition by awarding prizes for the highest score, most efficient design, or fun categories like 'Most Creative' or 'Best Teamwork'.

7. Showcase @ rezourceforce.com.au

Now you can share your project with the REZource Force Online Showcase. This is your chance to show your work to other schools, community members, and professionals working in the renewable energy industry.

Selected entries will be eligible to win prizes for their school!

To enter, use the QR code to fill out a short form and upload photos, videos, or documents that show what you created and what you discovered.

SCAN ME