

Emergency Communications Tower

Difficulty Intermediate	Time 45 minutes	Type Competition
-----------------------------------	---------------------------	----------------------------

Background

After a hurricane, a temporary communications antenna must be raised above nearby debris. The emergency team has limited materials and needs a structure that is tall, stable, and quick to deploy.

Engineering Problem

Build the tallest free-standing paper tower that supports a 200 g payload for 30 seconds.

Learning Objectives

- Apply structural design principles
- Plan within strict material limits
- Test and improve a prototype
- Use measurements to compare performance

Materials

- 20 index cards
- 30 cm masking tape
- Scissors
- Ruler or tape measure
- 200 g test mass
- Engineering notebook

Procedure

1. Study the materials without building for two minutes.
2. Sketch one tower concept and label the base, vertical supports, and payload platform.
3. Predict the tower height and identify the most likely failure point.
4. Build for 15 minutes using only the issued materials.
5. Measure the height before adding the payload.
6. Place the 200 g mass on the top platform for 30 seconds.
7. If the tower fails, document the failure location and make one repair using remaining material.
8. Retest and calculate a performance score: successful height in centimeters divided by grams of material used.

Engineering Requirements

- Stand without being attached to the table or floor
- Support 200 g for 30 seconds
- Use no more than 20 cards and 30 cm of tape
- Include a platform that prevents the payload from sliding
- Provide a measured final height

Constraints & Safety

- 15-minute initial build time
- No glue, staples, string, or added materials
- Payload must be placed by hand without holding the tower
- Height is measured from table surface to top of payload

Deliverables

- Initial sketch and height prediction
- Photo before testing
- Measured height and material use
- Failure observation or success evidence
- Performance score calculation
- Three-sentence redesign recommendation

Reflection Questions

1. How did the base width affect stability?
2. Where did compression or bending appear?
3. Which material use produced the most strength?
4. What would you change with five additional cards?

Engineering Tip

Folded card sections resist bending better than flat cards. Test triangular, tubular, and layered shapes.

Common Mistake

A very tall narrow tower may score well before testing but fail under the payload. Stability is part of performance.

Stretch Goal

Rebuild with only 12 cards and attempt to achieve at least 80% of your original height.

Career Connection

Structural and civil engineers design temporary towers, supports, and deployable structures for emergencies and field operations.