# Tower Building

Give teams a chance to apply the engineering design process by building the tallest spaghetti structure they can that can support a marshmallow on top.

**Each team will need the following materials:**

- 20 sticks of spaghetti
- One yard of masking tape
- One yard of string (Use string that can easily be broken by hand.)
- One marshmallow (Fresh marshmallows work best. Ping-pong balls or large pompoms can be substituted.)
- A timer or stopwatch

**INSTRUCTIONS:**

1. Have students work in teams of three or four. Review the goals and rules of the challenge.

   - The goal is to build the tallest freestanding tower using only the materials provided. (The winning structure must be stable and able to stand on its own.)

   - The entire marshmallow must be placed on top of the tower. (Breaking apart the marshmallow is not allowed.)

   - Teams don't have to use all of the materials, but they may not use more of any one given item. (Teams may break up the spaghetti, string, or tape.)

   - There will be a time constraint. Teams will have 20 minutes to build their tower.

2. Review the engineering design process graphic with students. Discuss how they could apply this process to the Tower Building activity. You may choose to ask students: What is the problem or challenge? What are the specifications? What strategies could you use to brainstorm solutions?

3. Distribute materials to each team. Have students discuss the materials and constraints (or limitations) on the design, and predict any challenges.

4. After teams have had an opportunity to predict any challenges, start the timer. At your signal, tell teams that they may begin.

5. Observe how teams approach the activity. Record moments when you witness teams using the design process. (For instance, are teams brainstorming ideas, sketching prototypes, analyzing their materials, or redesigning and improving their towers?)

6. If teams get stuck, ask them to think about things that could affect the stability of the tower, such as the size of the base or building with triangles vs. squares.

7. Once the time is up, have teams stand back and observe the towers. Measure them, as needed, and identify the winning team.

8. Have teams record any difficulties or successes that they experienced as well as note anything that they would do differently.

9. Invite teams to share their tower and their experience.

**DISCUSSION QUESTIONS:**

- How did you use the engineering design process to help you build the tower?

- Did your team run into any problems? How did you address them?

- What types of assumptions (if any) did your team make? How did they affect your tower? (For instance, teams may assume that the marshmallow will be light and easy to place on top of the structure or that a certain type of shape/base will create the most solid structure.)

- What did you learn about your team from this experience?

- How can you apply your experience with the Tower Building activity to the Future City Competition?

- In what other areas of your life have you or could you apply the engineering design process to help you solve problems?

Remind students that the design process isn't linear as the graphic and/or video may imply. In fact, the steps may overlap and fall out of order. For example, teams may have shuffled between brainstorming solutions and designing their tower a few times. Ask a few groups to share whether or not they experienced this while building their tower and how their team handled revisiting certain steps in the process. Teams will see that engineering is not only about solving problems but also about being creative and working as a team.