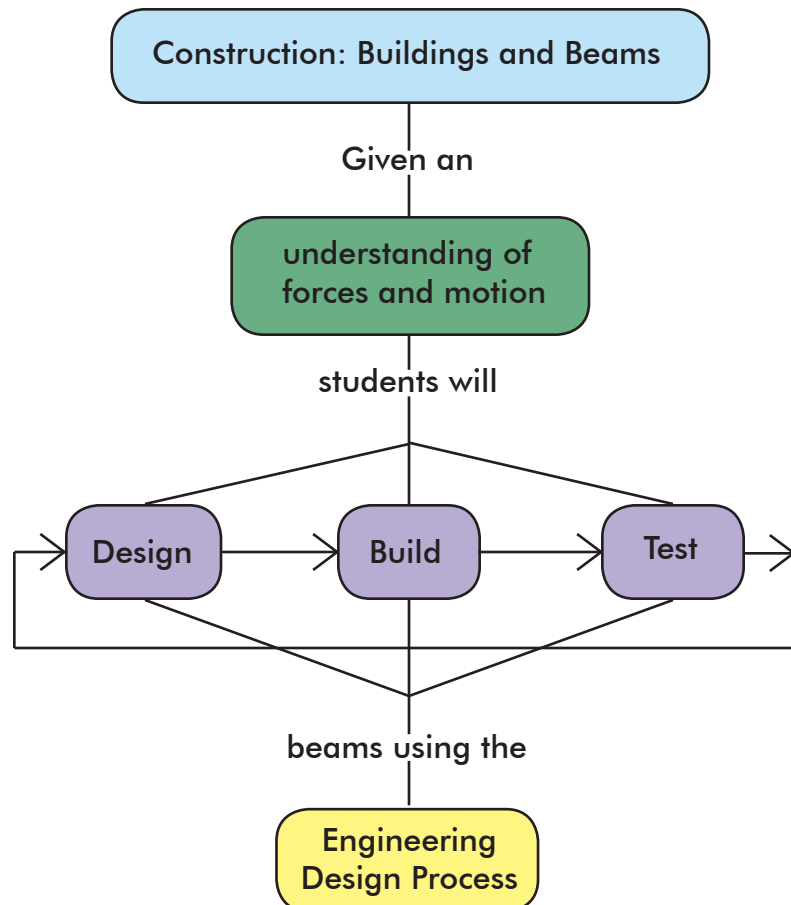


Construction: Buildings and Beams

This unit integrates the study of technology, science, and mathematics through the design and development of a laminated paper beam.



Conducting the Unit

Notes:

There are six main topics in this unit. Each topic varies in length and scope depending on the schedule and length of the teaching time.

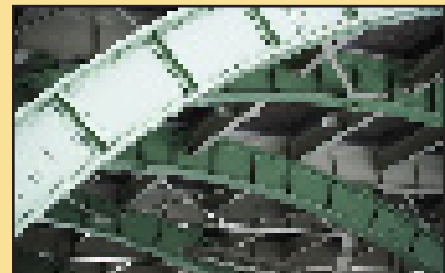
Topic I: Introducing Beams (1 hour)

1. Share the design challenge (page 36) the students will be completing. Explain that they will first study different ideas that will help them to design a better beam. These ideas are what engineers look at when they plan and design.
2. Organize the students into pairs.
3. Begin the unit with Think, Pair, Share activity (page 31):
 - Ask the students, "What do you think of when you hear the word beam?"
 - Give students 15 seconds to think, 30 seconds to pair with a partner, then share with the class.
 - A variety of answers are possible: a beam of light, a balance beam, a sunbeam, a radio signal, the extreme width of a ship, a radiant smile, hopefully someone thought of beams that are used in building structures. Tell students they will be studying beams used in construction. For their first journal entry, you want them to write the following (see the first two prompts on page 31):
 - Describe a beam and discuss where beams are located. See Transparency #1.
 - Draw a sample of a beam.
4. Discuss why engineers use a portfolio and how students will draw pictures of things, write down ideas, remember, make lists, plan, and record results. (Keep journals and work in a folder as students complete the entire portfolio.)
5. Pass out file folders and have the students place their Think, Pair, and Share entry inside and number each sheet so they stay organized.



Topic II: Forces on a Structure (1-2 hours)

1. Explain that bending causes material to be in compression and tension.
2. To introduce compression and tension, draw a series of lines on the top and bottom of a soft 2" x 2" x 10" sponge.
 - Have students bend the sponge into a U shape. Observe what happens to the lines. Inside they get closer together—compression; outside they get farther apart—tension.
 - Have pairs of students stretch a rubber band. That shows tension. Now have pairs of students press down (squeeze) on the side of an unopened soda can. This shows compression.
 - Have pairs of students link fingers and lean away from each other. This dem-





Construction Daily News

Design Challenge

You are a structural engineer and you are helping your parents design a family room addition to a house that has a deck on the roof. The challenge is to design a deck strong enough to support family and friends. You will create the strongest beam possible. A successful beam will support family, friends and the deck itself. The strength/efficiency of the beam will be determined by dividing the final load by the beam's weight.



Materials

- ✓ You may use any type of paper (typing paper, construction paper, etc.).
- ✓ You may use any type of adhesive (tape and staples are not allowed).

Limitations

1. The beam must span 10 inches.
2. The beam must measure no more than 12 inches long and 1 inch in height and width. (1" x 1" x 12")
3. The beam must be made from a paper product.

Presentation

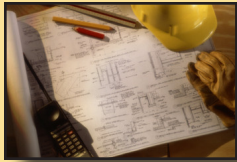
- ✓ You must have a sketch showing the side and end view of the beam.
- ✓ You will present a materials list.
- ✓ Your team may have no fewer than two beam-designs.
- ✓ Write a paragraph describing what you learned.



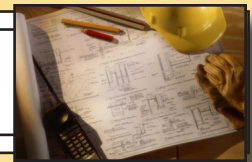
Roof

The overhead covering of a building with its framework support.





Paper Beams



Identify the Challenge

What is the challenge? _____

Brainstorm with your team ways to construct the beam using only one sheet of paper.

Explore Ideas

Draw end and side views of two possible beams in the boxes below.

Beam Idea #1

Beam
End

Beam
Side

Beam Idea #2

Beam
End

Beam
Side