

Structures and Bridges

STRUCTURE is a way of building. Structures are interrelated parts that unite to take a whole. In nature, there are natural structures, like beehives, sponges, shell fish, and bones. Human-made structures include buildings, towers, bridges, and dams.

All of these structures are made up of many dependent parts. Lose one part and the whole structure collapses. Structural parts bind themselves together, giving the entire structure more strength and rigidity. Structural parts are designed to withstand three types of forces: tension, compression, and shear.

Tension force is a pull, like a rubber band stretching.

Compression force is a push, like a basketball hitting the floor.

Shear force is a splitting or slicing, like a tree limb with a swing on it that may shear where the branch meets the trunk from the weight on the swing.

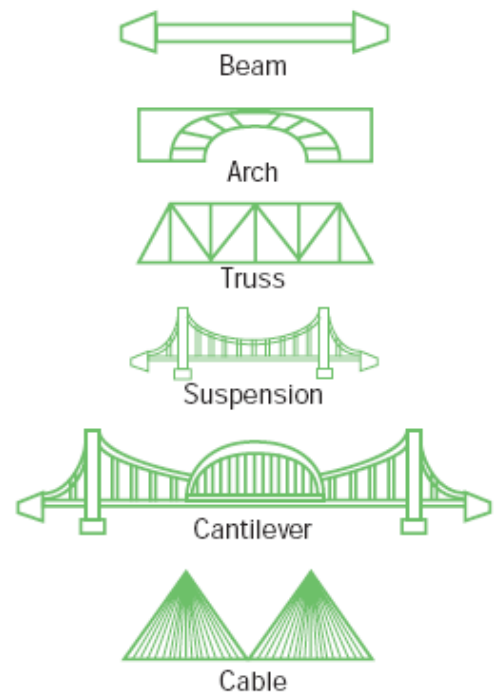
Bridges

Bridges have been around since the first tree fell across a stream, allowing animals and people to cross to the other side without getting wet. There are six types of bridges illustrated to the right.

All bridges are designed to resist forces of tension, compression, and shear, both to hold themselves up and to withstand loads that are placed on them. Loads applied to bridges include vehicles, wind, rain, ice, earthquakes, and the weight of the bridge itself. To help overcome these forces, bridges are built to distribute all weight loads across the entire structure, with steel trusses or cables and steel rebar rods in the concrete. All parts share equally in the load.



Forces applied to a beam bridge.



Examples of bridge types.

QUESTIONS: Answer the following questions

Write the answers in complete sentences.

1. Name three natural structures.

2. Name three human-made structures.

3. Name the types of loads on a bridge.

4. Name the three forces on a bridge.

5. Name 12 types of trusses.

QUESTIONS pg. 2: Answer the following questions

6. What is compression? Give an example.

7. What is tension? Give an example.

8. What is shear? Give an example.


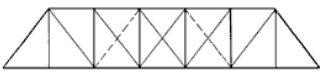
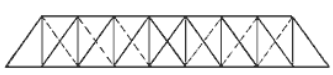
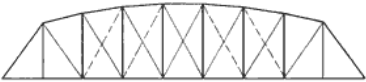
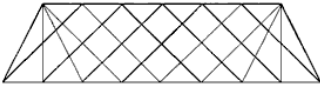
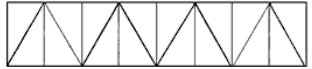





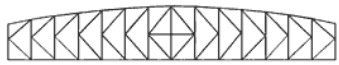
9. A bridge that uses a series of triangles is called a _____ bridge.

10. Why is proper engineering an important factor when designing a bridge?

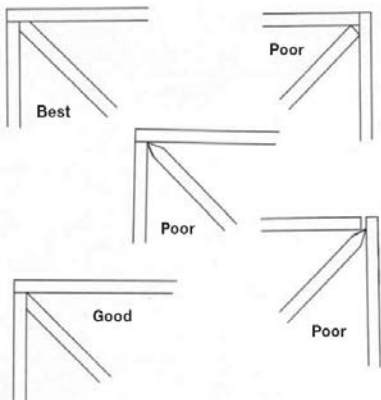
Exploration Activity

Which truss will hold the most?

Each Group will choose a different type of truss to construct.

		
Warren	Pratt	Howe
		
Parker	Lattice	Subdivided Warren
		
Whipple	Post	Petit
		
Kellogg	Pennsylvania	K-Type

- Width: 8" Height: 3-3.5"
- In Solidworks draw a scale drawing (2D Sketch) of the truss to construct.
- Print the scale drawing out
- Put wax paper over the drawing and affix to cardboard work surface.
- Cut balsa wood members superglue and pin members in place
- Follow the guidelines below for joins:



TESTING

Each truss will be tested on the structure tester.

Load: (LBS.)

Warren_____	Pratt_____	Howe_____
Parker_____	Lattice_____	Sub. Warren_____
Whipple_____	Post_____	Petit_____
Kellogg_____	Pennsylvania_____	K-Type_____

1. After evaluating the types of trusses, what type would you choose for your bridge?

2. What factors influenced your decision? Why?