



Glossary

What is a structure?

A structure is something which will support an object or a weight. It can also be described as anything that provides support and is made from more one or more parts. When classifying structures by design they can be divided into three groups: frame, solid and shell structures.

Frame: Frame structures are skeletal looking structures. They use beams, and columns to resist the load. A beam is a long sturdy piece of steel or wood that holds the load of the roof or the floor of a structure. They usually are horizontal from one end of the structure to the other. Columns are vertical, from the floor to the roof of the structure. They are usually cylindrical in shape, and are made from steel, wood or concrete.

Different types of frame structures include:

Natural - skeletons, spider webs

Manufactured - snowshoes, bridges, play structures, lacrosse stick, lacrosse net, teepee

These types of structures are often built because they are fairly inexpensive to manufacture and are also easy to construct.

Advantages of a FRAME structure: strong and sturdy, cost less to build and widely used, easy to build and can be transported

Disadvantages of a FRAME structure: if damaged structure becomes unstable, one single part of the structure cannot support a load by itself, parts must work as a system

Shell: Shell structures are made with thin material on the outside, but are hollow on the inside. These types of structures are usually curved to help protect the structure from other forces. Shell structures are the lightest of the three main types of structures.

Some examples include:

Natural - eggs, turtle shell, coconut shell

Manufactured - balloons, boxes, tin can, Igloo, drum, canoe, rattle

Shell structures are light and use few materials. However, their design is extremely tricky. Engineers have to ensure that the curve is correct and the materials are used effectively.

Advantages of a SHELL structure: light weight, strong and rigid, can put things inside of it

Disadvantages of a SHELL structure: if it cracks or breaks, it will lose strength

Solid: Solid structures, also known as a mass structures, are formed by combining different materials. These materials are piled one on top of another and compacted. This makes the structure sound, strong and stable.

There are a variety of solid structures:

Natural - mountains, coral reefs

Manufactured - pyramids, mound house, serpent mound

Solid structures tend to be able to last for years, and withstand a lot of weathering and erosion. However, they weigh a lot. Engineers must ensure that they are using the appropriate building materials for the function of the structure to make sure that they weight does not disrupt the purpose of the structure.

Advantages of a SOLID structure: strong, lasts a long time, can withstand great forces

Disadvantages of a SOLID structure: expensive to build, materials heavy, difficult to move



Classifying Structures

Name: _____

Date: _____

Structure	Justification (why you think this)	Type of Structure	What is the function?



What are the functions of the items below?





Identifying Forces Acting on a Structure

Page number	Structure	Forces acting on the structure when in use	Internal or External?



Design Challenge: Tower Build

Team members names: _____

Tower Name: _____

Materials: 20 skewers, 1 marshmallow, 1 m each of tape and string

Height of Tower: _____

Load Support: Pass Fail

Wind Test: Pass Fail

Earthquake Test: Pass Fail

Sketch final structure below:



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Questions:

1. What are the various external and internal forces acting on your structure? Describe each force.
2. Did your structure hold the load? Explain why or why not.
3. Did your structure survive the wind test? Explain why or why not.
4. Did your structure survive the earthquake test? Explain why or why not.
5. What was the most difficult part of this challenge? How did your team overcome this?



Canoe Testing

Group members: _____

Load placement	Prediction	Actual weight/number of marbles held
One end of canoe		
Centre of canoe only		
Evenly distributed		



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Ergonomic Redesign

Design item: _____

Ergonomic considerations:
