

TESTING STRUCTURES

KEY IDEAS

- Structures need to be strong enough to do the job they are made for
- The strength of structures depends on their design and the materials used
- Models of structures can be tested
- Sometimes the real structure has to be tested

EXAMPLE QUESTIONS

- When do you need a test structure?
- Why do some structures need to be tested for strength?
- What other kinds of things can structures be tested for?

THE STRENGTH OF A STRUCTURE DEPENDS UPON ITS DESIGN AND MATERIALS

- Forces can change the shape of an object (for example, a hammer can change the shape of a piece of clay).
- Structures need to be designed in a way that will ensure that they can withstand the forces that are likely to act upon them.
- Two things are important here: first, the design of the structure, and second, the strength of the material, or materials, used to build the structure.
- The most efficient structures are those which successfully combine design with material strength in an economic way.

THE SHAPE OF A STRUCTURE IS IMPORTANT

- Some shapes are stronger than others.
- The shape of a structure depends upon the materials from which it can be made.

- Materials can be rigid (like steel bars or pine logs) or flexible (like plastic sheeting or rubber).
- Some materials can be given extra strength by careful design and shape (for example, a spider's web or a wicker basket) or by being combined with other materials in the structure (such as the poles and guy ropes of a tent).
- Some structures, such as buildings and bridges, can be made from a variety of materials.

STRUCTURES HAVE FORCES APPLIED TO THEM

- Essentially, structures are designed to withstand forces. For example, a building must not collapse, a crash helmet must protect the head, and a shell must protect its contents.

STRUCTURES MAY NEED TO BE TESTED

- Sometimes the only way of finding out if a structure works is by testing the real thing.
- In some cases, however, the real structure cannot be tested to destruction (bridges, ships, or buildings, for example).
- Instead, the strength of the design and materials is tested using scale models before the full-size structure is built.
- Often, different model designs are tested to determine the best structure to fit the requirements.
- Critical structures are usually designed with a wide margin of safety; that is, the structure are designed to withstand forces and conditions far more destructive than might reasonably be expected.

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