

Structures

Knowing the different loads that structures have to carry, helps designers to decide on the correct material to choose when designing structures. A good understanding of the **forces** that act upon structures is, therefore, essential for all designers.

1 Forces

In this section, you will learn about forces. Forces can be static or dynamic, and loads can be even or uneven.

Designers need to know about the different loads that structures have to carry. Designers also have to know about the different forces caused by these loads. This information helps designers to choose the correct material and the correct structures for their design.

1.1 Static or dynamic loads

Structures always support a load. The load may be static or dynamic. **Static forces** do not move, for example a book on a shelf or the roof of a building. You can calculate static forces quite easily.

Dynamic forces move and change. Two examples of dynamic forces are a diver on a springboard and a strong wind blowing against a tent. Dynamic forces tend to produce much greater forces than static forces. If a diver simply stands on a springboard, they will create a force equal to their own weight. Once they start bouncing, the force acting on the board will be five or six times greater depending on how high they bounce.

All structures must be able to **withstand** dynamic loads even though they mainly support static loads. For example, **bunk beds** have to be strong enough to take the dynamic forces that are created by children playing on them. The main purpose of a bed, however, is to support a sleeping person, which is a fairly static load.

Well-designed structures must be able to withstand all types of forces acting on them. A bridge is a very good example of a combination of static and dynamic forces.



FIGURE 19 Static and dynamic forces

Activity 1 Combination of static and dynamic forces

- 1 Is it possible for a structure to experience a dynamic and static force **simultaneously**? Use an example to explain your answer.
- 2 Investigate and discuss illustrations A and B.
 - a Are illustrations A and B good examples of static and dynamic forces at work simultaneously? Explain your answer.
 - b What type of force will move structure A as shown by the arrows?

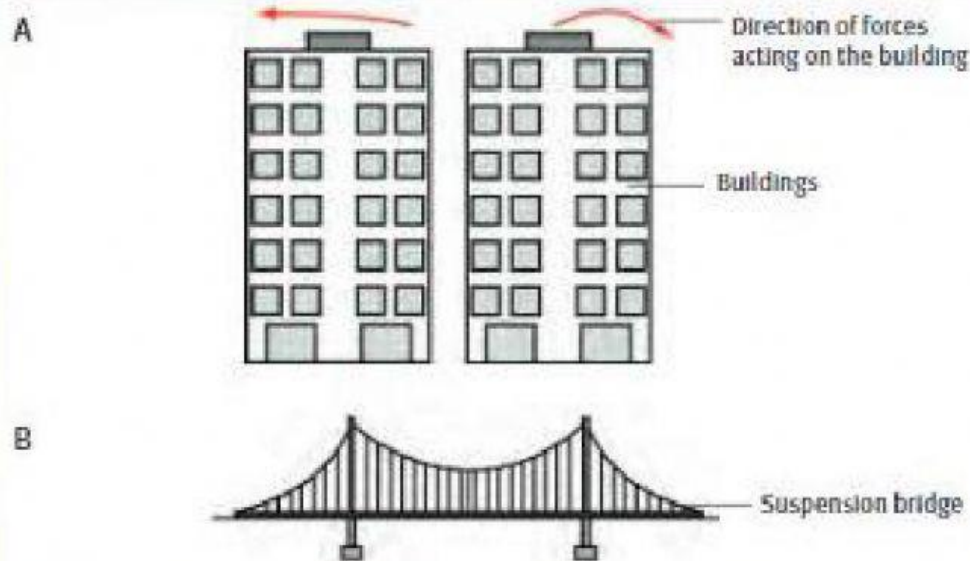


FIGURE 20 Static and a dynamic forces acting at the same time are called combination forces

Answers

1

2a

2b

