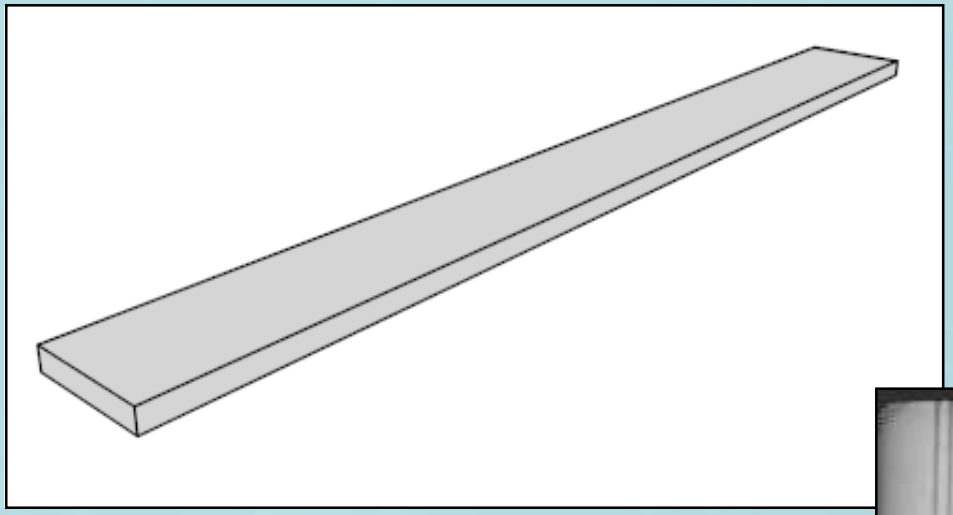
Forces on Structures



In this presentation you will:

- identify the forces that act on structures

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Knowing how forces act on structures can help to make sure the structure is good enough for its intended purpose.

Forces

The forces acting on a structure:

- support it's own weight
- carry the loads due to weather
- the force of people using it.

Question 1

Which of the following causes force to act on a structure?

A) The weight of the structure

B) The weather

C) The people using it

D) All of the above

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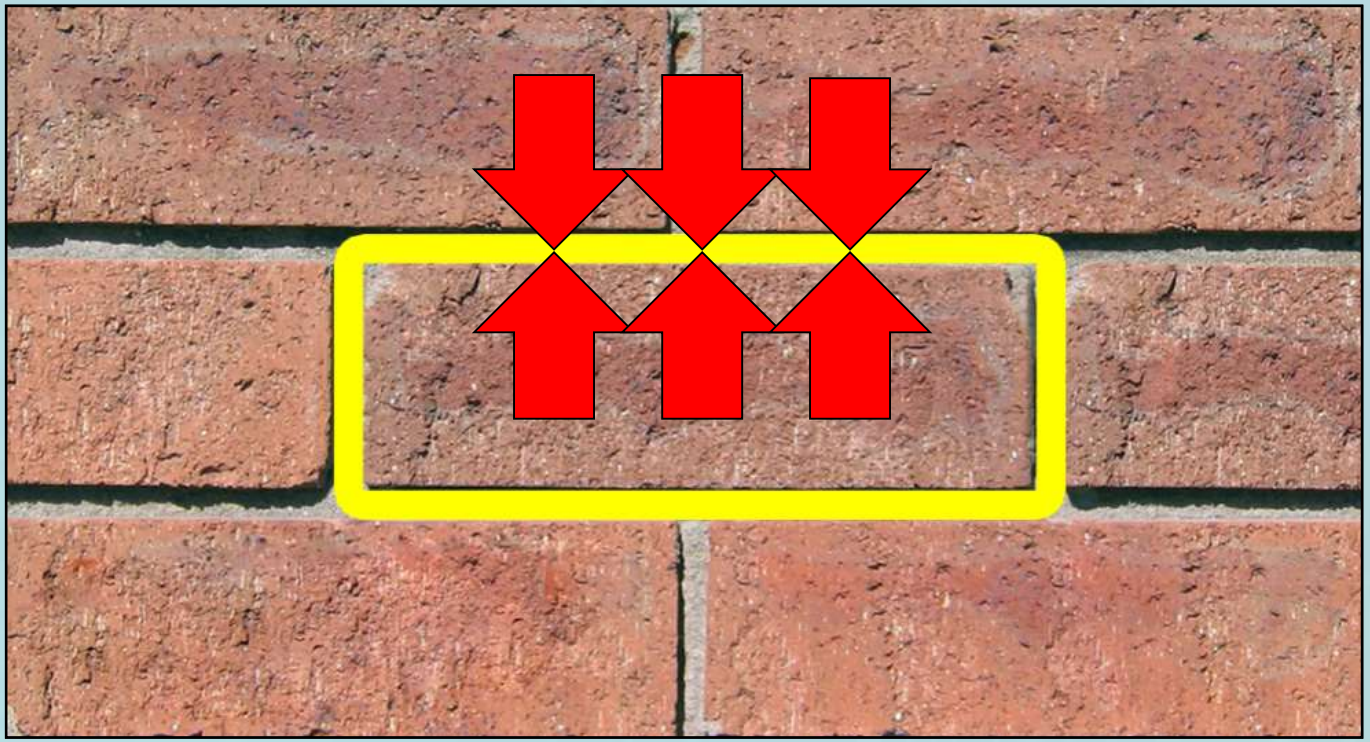
Forces on Structures

Imagine a brick in the base of a wall.
The brick has to resist a load due to the weight of the bricks above it.



As the brick is squashed, it exerts a force back up on the wall equal and opposite to the force acting on it.

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If the load is too great, the brick will fail and be crushed.

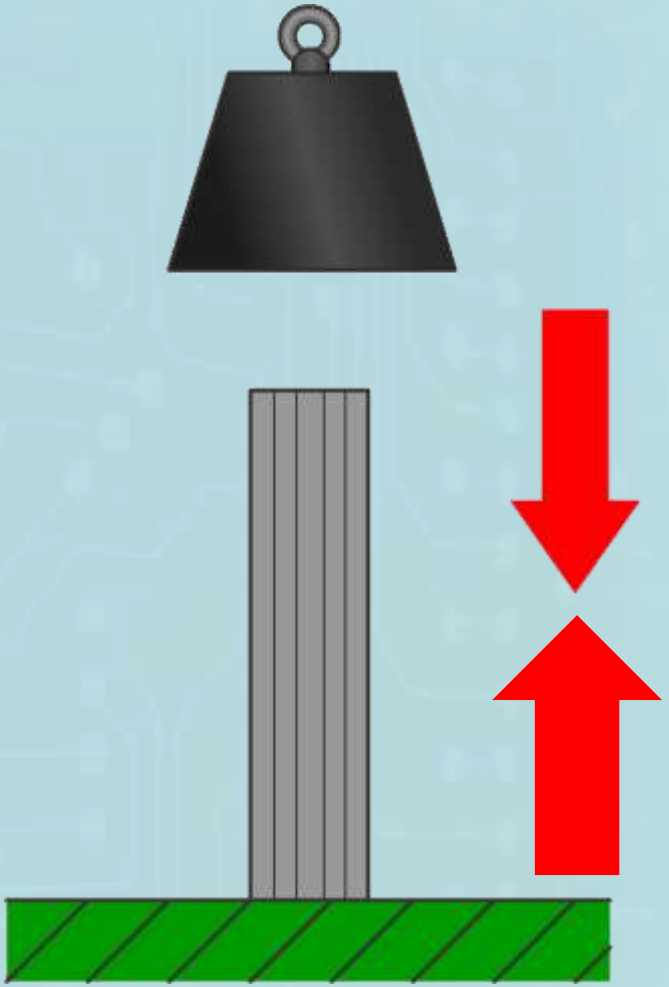
Compression force acts to **squash** part of a structure.

Materials that are good for resisting compression forces are:

Stone

Steel

Concrete



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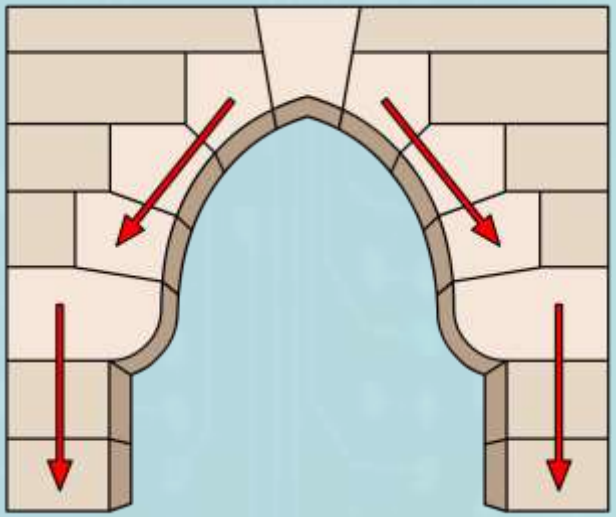
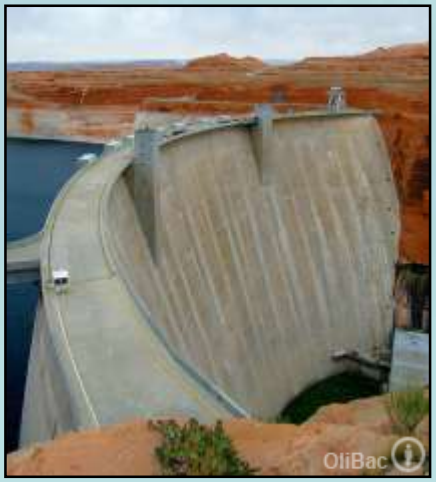
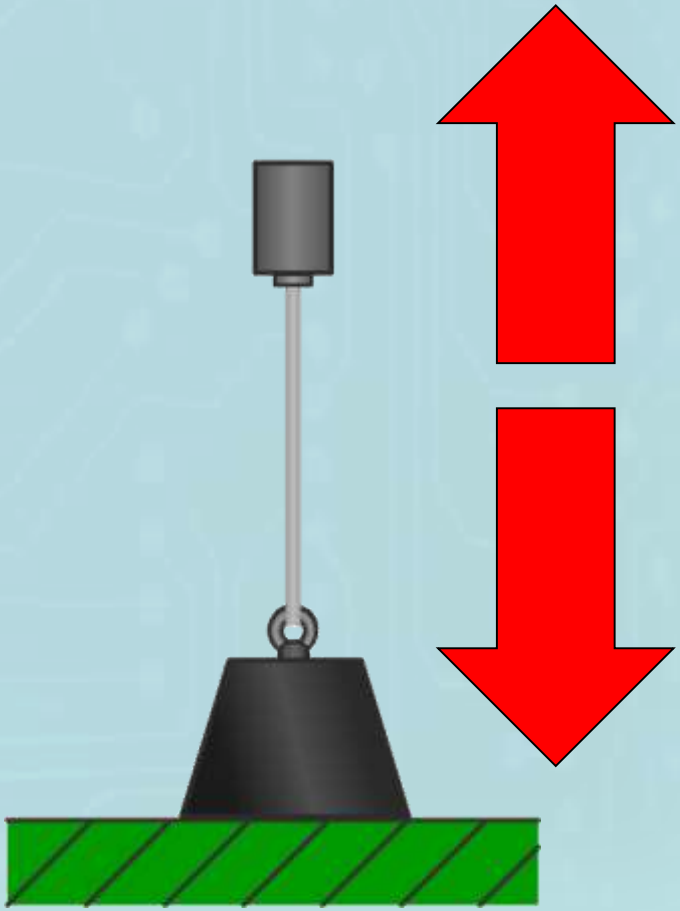
The arch is an extremely old design for a structure that uses a compression force to stay together.





Tension force acts to **stretch** part of a structure

When an elastic band is stretched, a tension force is applied to it.



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Tension

Materials that are strong under tension:

Steel

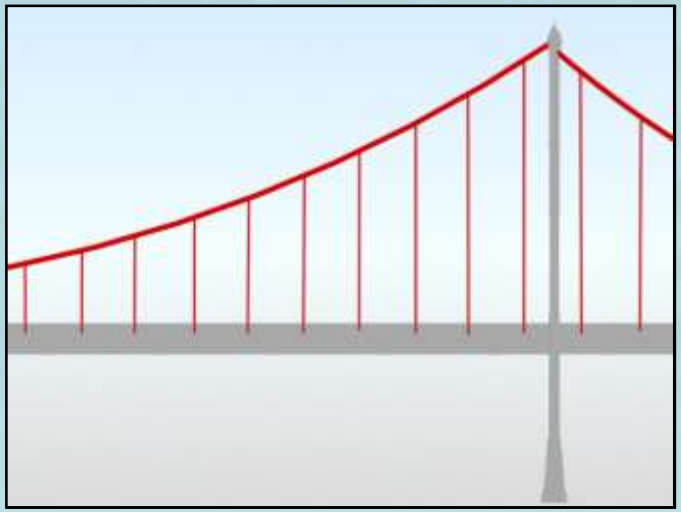
Wood

Materials that are weak under tension:

Stone

Concrete

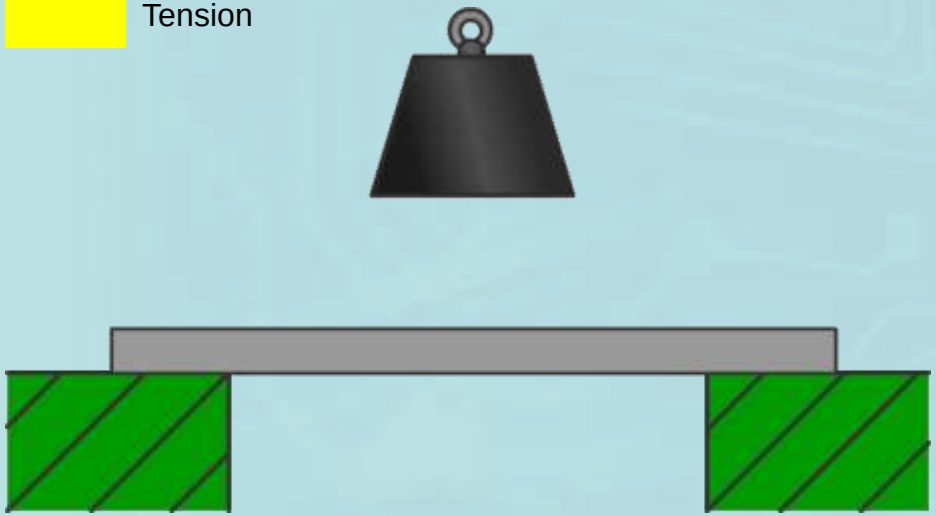
In a suspension bridge, the deck hangs from two towers by many steel cables under tension.



Bending force is a combination of compression and **tension** forces.

Compression

Tension



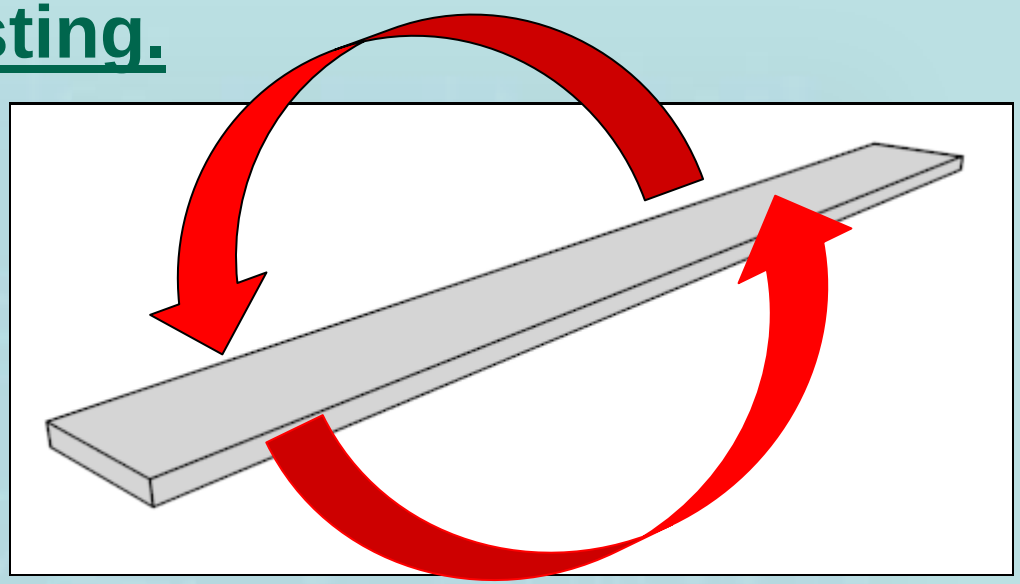
When a force is added to the top of a plank it bends.

The top of the plank is under compression and the bottom is under tension.

Materials used to carry bending forces must be strong in tension and compression.
Steel is a good example of this.

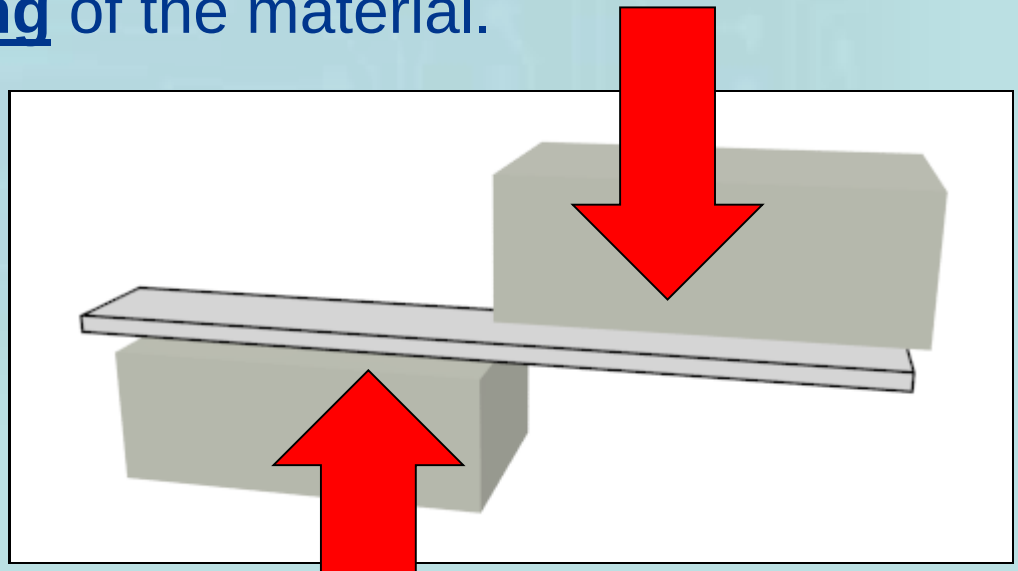
Torsion force causes **twisting.**

Some bridges have to resist torsion forces created by the wind trying to twist them.



Shearing force causes **tearing** of the material.

Fabric structures such as tents have to be resistant to shearing forces.



The Tacoma Narrows bridge collapsed due to torsion and shearing forces produced by the wind.

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Question 2

A load is applied to a column causing it to be squashed slightly.

What is this force called?

A) Compression

B) Tension

C) Torsion

D) Shearing

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Question 3

A load is applied to a cable causing it to be stretched.

What is this force called?

A) Compression

B) Tension

C) Torsion

D) Shearing

Next >

Question 4

A load is applied to the deck of a bridge causing it to twist.

What is this force called?

A) Compression

B) Tension

C) Torsion

D) Shearing

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Question 5

A structure in this diagram is subject to bending by a force.

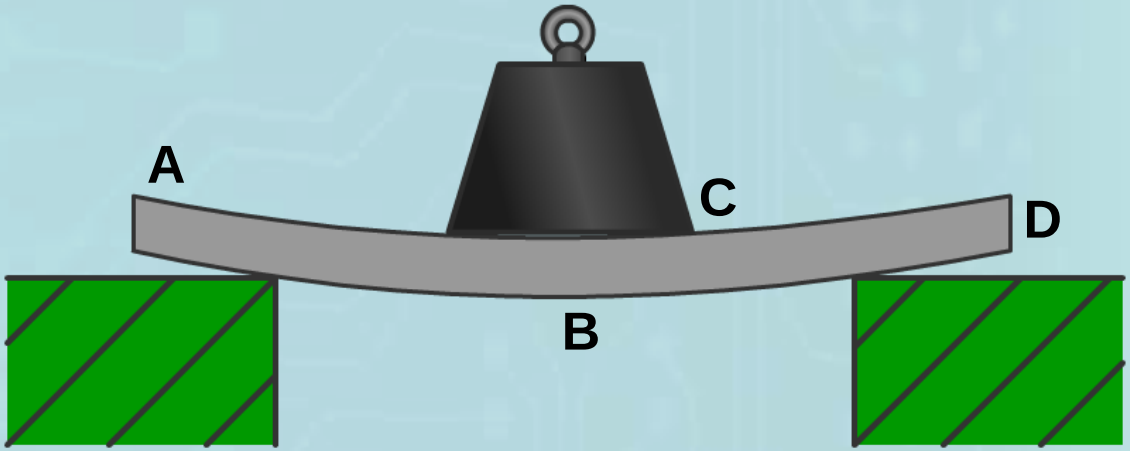
Where is the tension force greatest?

A) Point A

B) Point B

C) Point C

D) Point D



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