

Engineer

Bridges and engineers

Bridges are structures that have been used for centuries to provide a safe route over an obstacle, such as a valley or river. Over time, engineers have improved bridge design and used stronger materials to span greater distances and support more weight. Examples include:

Menai Bridge, Wales

Engineer: Thomas Telford

Date completed: 1826 Span: 176m Material: iron



Clifton Suspension Bridge, England

Engineer: Isambard Kingdom Brunel

Date completed: 1864 Span: 414m Material: steel



Forth Bridge, Scotland

Engineer: Sir John Fowler and Sir Benjamin Baker

Date completed: 1890 Span: 2467m Material: steel



Forces

Two important forces that engineers consider when building a bridge are compression and tension.

Compression is a pushing force that squashes or makes something smaller.

compression

Tension is a pulling force that pulls things apart.

tension

When these forces are balanced, a bridge is strong and stable. When they are unbalanced, a bridge will collapse.

Types of bridges

Beam bridge

Beam bridges have a horizontal beam and support piers. The vertical piers absorb forces from the horizontal beam when heavy loads are on the bridge.



Arch bridge

Arch bridges have a curved arch supported by abutments at each end. The arch spreads the forces from heavy loads outwards towards the abutments.



Truss bridge

Truss bridges are similar to beam bridges but use triangular shapes called trusses. The forces from heavy loads are spread across the truss structure.



Suspension bridge

The roadway on a suspension bridge is hung from vertical cables supported by towers. When heavy loads are on the bridge, there are increased tension forces in the vertical cables, which are transferred to the towers.



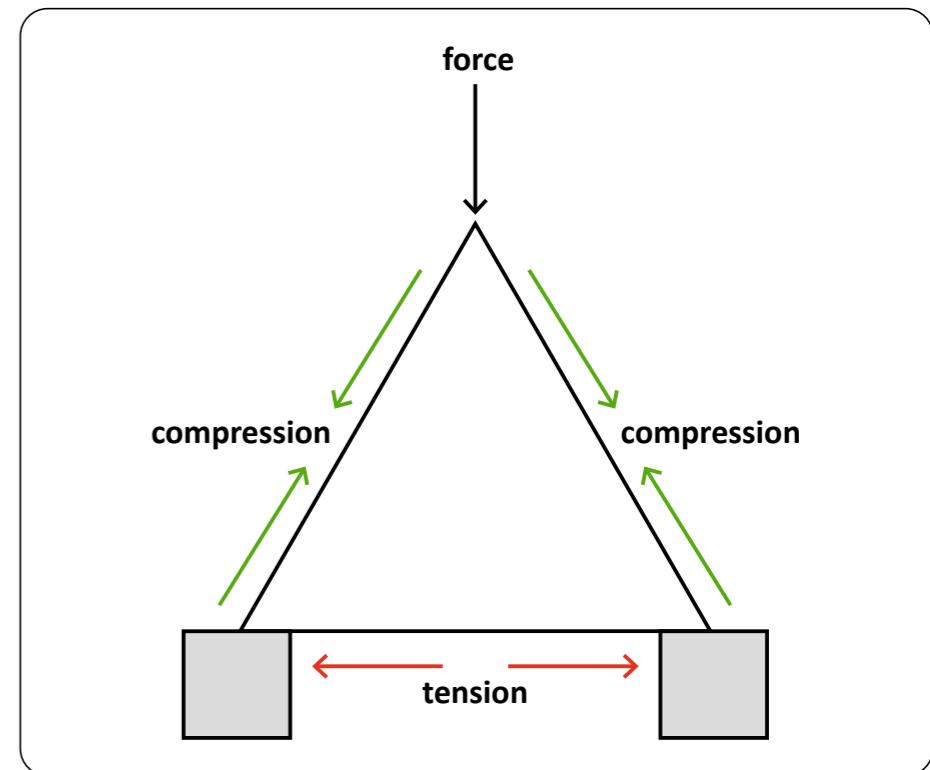
Strengthening paper bridges

Paper bridges can be strengthened by:

- increasing the number of layers of paper used
- changing the shape of the paper
- folding the paper into a concertina

Triangles for strength

Triangles provide structural strength and stability by distributing the force down each side. Triangles do not collapse or distort easily and are commonly used in bridge building to provide support.



Glossary

concertina

Folds made alternately to the front and back of a material.

distort

To change the original shape of something.

engineer

A person who designs or builds machines, electrical equipment or structures such as roads, railways and bridges.

span

The length of something from one end to the other.

