

# *Bridges*



# Bridges

There are four different kinds of bridges

1. Beam bridge

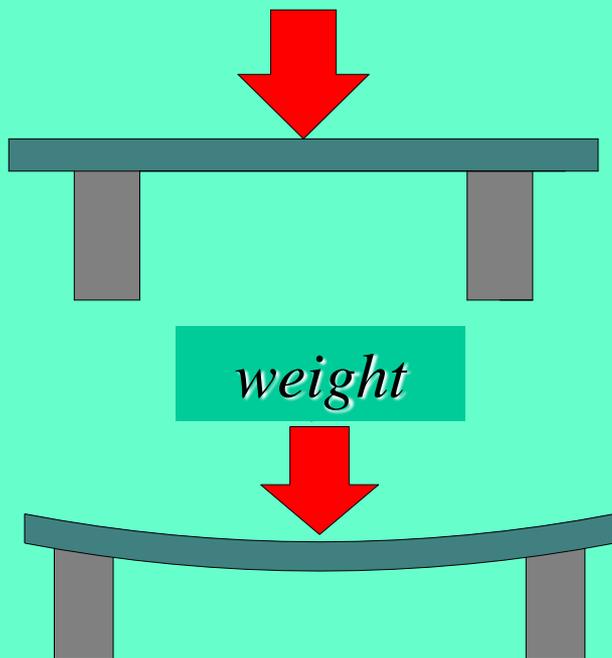
2. Cantilever bridge

3. Arch bridge

4. Hanging bridge

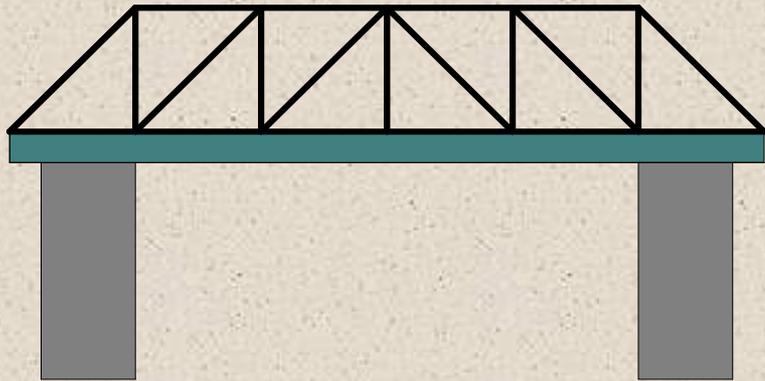
# Beam Bridge

This is the oldest and simplest of the four types of bridges. Originally people used a long piece of stone or tree trunk to cross small streams. Its possible that bridges made of stone slabs found in south west England are the oldest in the world. We don't know exactly when they were built but they are still standing.

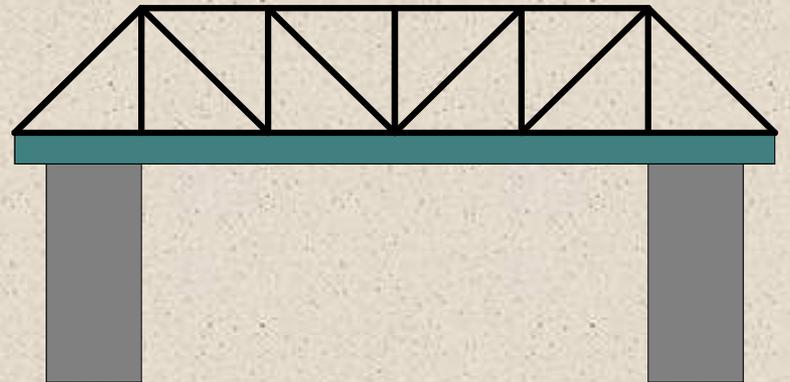
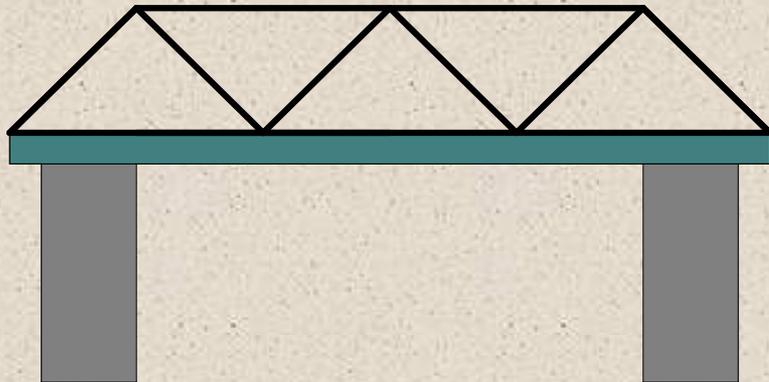
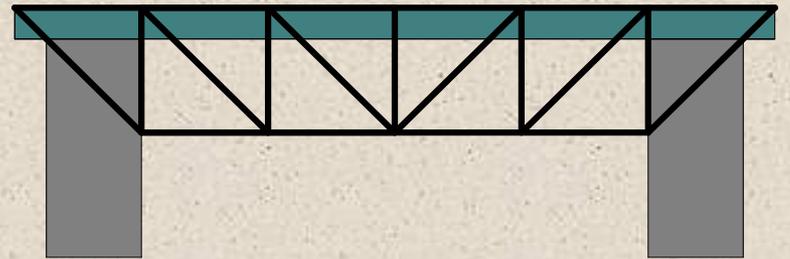


As weight is placed on the beam the compression force shortens the upper part. This tension causes the lower part to lengthen. The beam bends and if the pressure is too great it will break.

Many of the beam bridges that you see above roads are made of steel or concrete to make sure that they are strong enough to hold the weight. The size of the beam, and especially its height, controls the span of the bridge. Its possible to put more weight on the beam by increasing its thickness or height. A framework or truss is used to build high bridges and this structure spreads the tension and the compression.



*Examples of truss patterns*





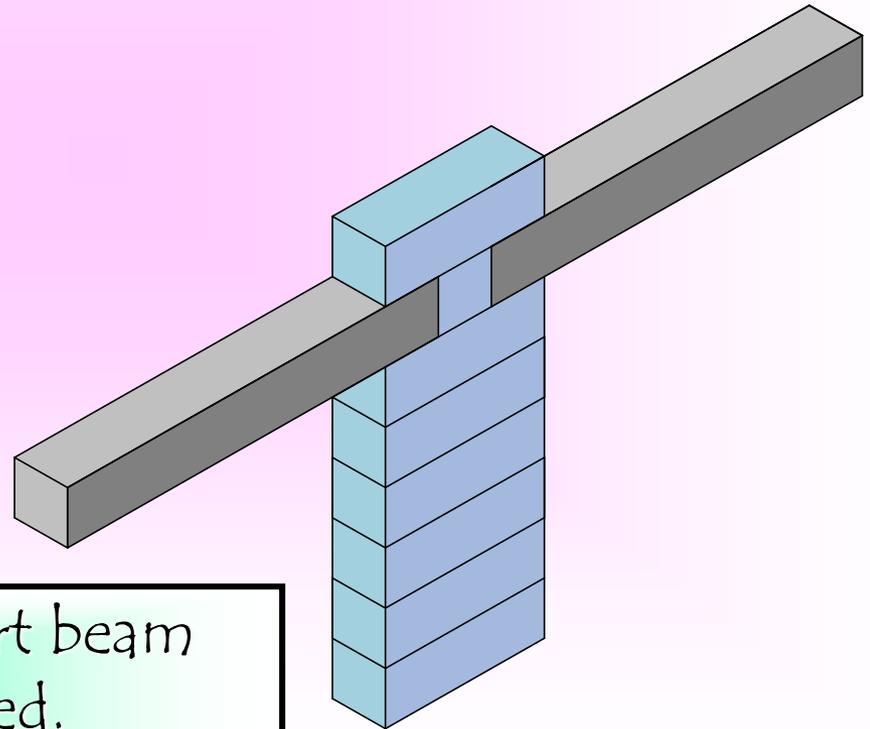
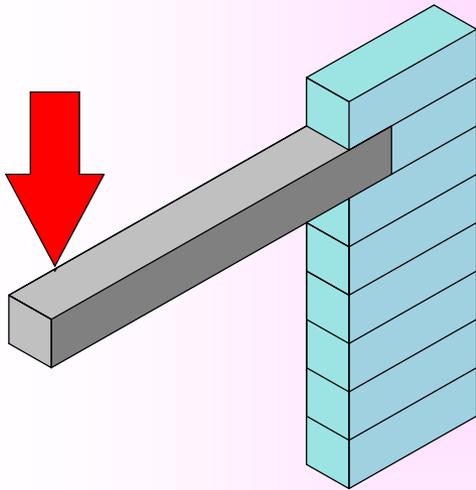
# Beam Bridges



A beam bridge can be one span (one beam) or multi spans (many beams)

# Cantilever Bridges

Cantilever bridges are made from beams supported on one side only. A cantilever bridge is a form of beam bridge.



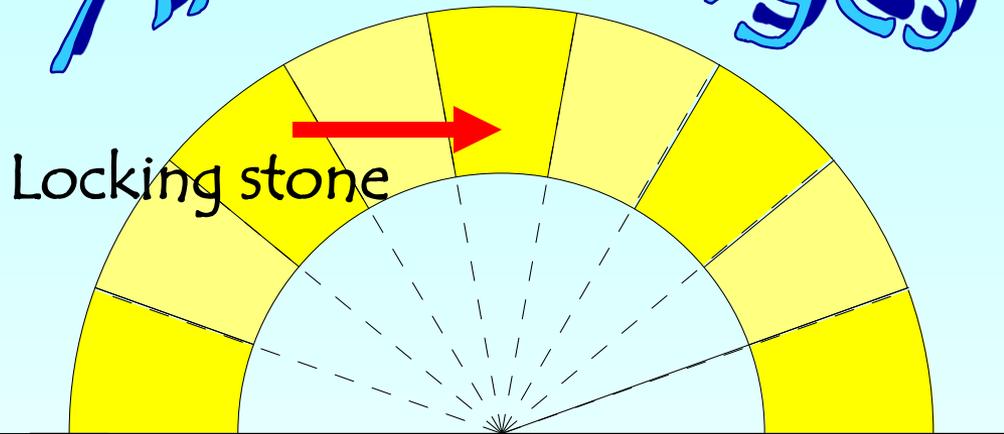
Two cantilevers with a short beam between them are often used.

The railway bridge over the river Forth in Scotland. An example of a cantilever bridge.

Short beam



# Arch Bridges



This type of bridge was invented by the Romans. They realised that a wedge shaped stone called *voussoirs* could carry heavy loads if built in the shape of an arch

*A wooden framework has to be built to support the stones while building the arch bridge. After putting the locking stone in place the wooden frame is removed and the arch should stand by itself.*



*Stone bridges*



*Steel*



*Concrete*

## Arch bridges

Originally Arch bridges were built using materials such as stones and bricks that can withstand compression. But many modern bridges are built using concrete or steel. Strong support is needed on each side of the arch to stop it from spreading out.

# *Hangin**g** Bridges*

A hanging bridge can stretch over long distances without much material being needed to build it. Perhaps you have seen a simple hanging bridge in a film or adventure story about the jungle on the television.

Materials- climbing plants and bamboo



## Hanging bridges of Wales

Two of the most famous hanging bridges in the world are in Wales.



*Menai Bridge*

Hanging bridges to carry roads depend on tight strong steel cables. Strong winds can be dangerous for a hanging bridge and they must be carefully designed to cope with stormy conditions.



*Severn Bridge*



*Now you have learnt about  
different bridges.  
Can you help solve a  
problem?*

*Note what the problem is*

*Look in books and on the internet for examples..*

*What must be done to solve the problem?*

*What is its function?*

### *My Ideas*

The Problem- A wide river runs through the middle of a village. On one side of the river there is a shop and a number of houses and on the other side there is a school and more houses. To cross the river the villagers must travel far to cross the bridge in another village. As the river is so wide and deep many boats and small ships sail up the river carrying goods to other towns and villages along the river.

### *Different ideas*

# *Design phase*

*On a plain piece of paper, sketch different types of bridges that could solve the problem.*

*Can you label what type of bridge they are from the information above?*

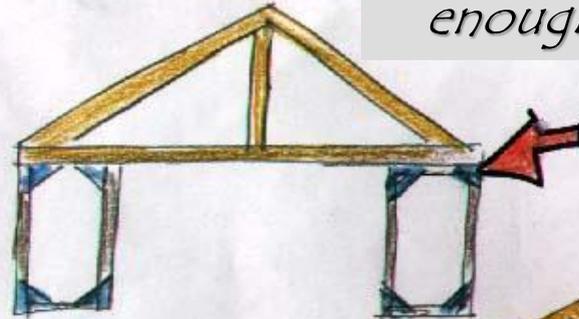
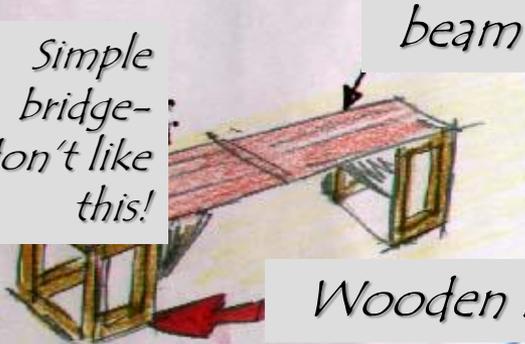
*Label each design with materials needed and the pros and cons of the design.*

*Use the next slide to help you.*

# Design ideas

Sketch different ideas on this page. Remember that your work has to solve the problem and answer the brief.

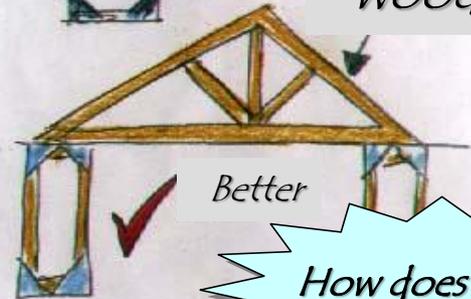
Simple bridge - don't like this!



Strong enough?

Card triangle

wood



What will you use to make it?

Plastic to make road



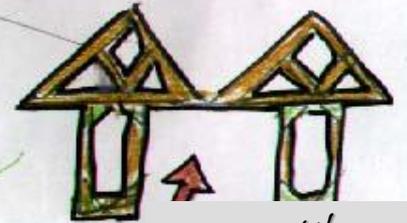
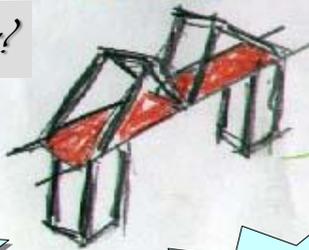
I like this

Make this higher?

Strengthen frame

Good idea!

How does it look?



Think about different ideas

How will it work?

# *Final planning for your bridge*

*Choose your favourite design*

*Detailed drawing*

*Measurements*

*How to build it ?*

*Materials*

*Putting things in order*

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*Materials I need*

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*Tools I need*

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*Directions*

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# *Can you build a prototype of your bridge?*

*Can you find materials at home to use to help build a prototype of your bridge?*

*Consider the following:*

- What size does it need to be ?*
- How can I make it strong enough?*
- How will I make it pleasant to look at?*

# ***Reflect on the bridge you have created...***

*Did you use appropriate materials? How do you know?*

*What did other people think about your bridge?*

*Was your bridge fit for purpose?*

*How could you improve your bridge next time?*