

Bridging the gap

The three main types



The names of
the three main
types of bridge
are:



BEAM



ARCH



SUSPENSION

Your objectives are to

Understand the differences between the bridge types

Have an idea of what type of bridge you want to build

Understand the impacts bridges have on communities

Understand considerations by engineers when building bridges



What have you noticed about bridges?

How many do you use every day?
What bridges stand out for you?
Why is a bridge important to you?



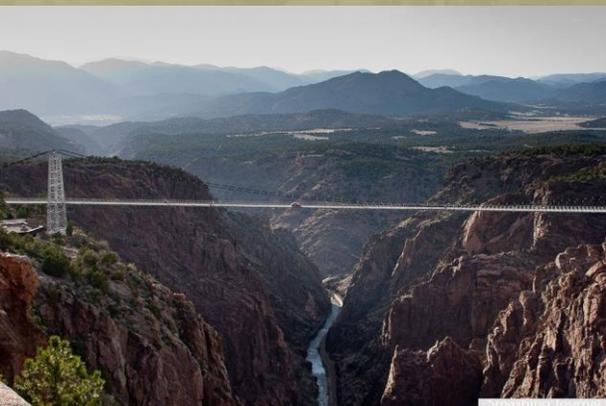
Recognition for bridges!

Most bridges you use are just considered a part of the road system. But they are so much more than that!

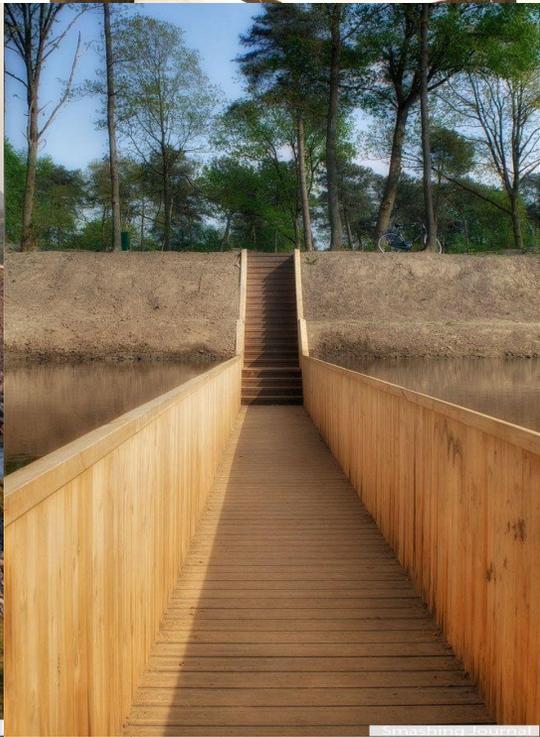
Contribute heavily to social lives

Increases impact on local businesses

Impact upon environmental development



Unique bridges

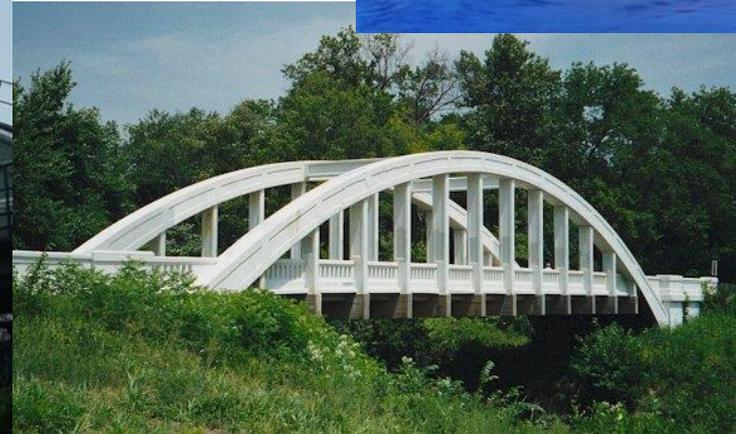
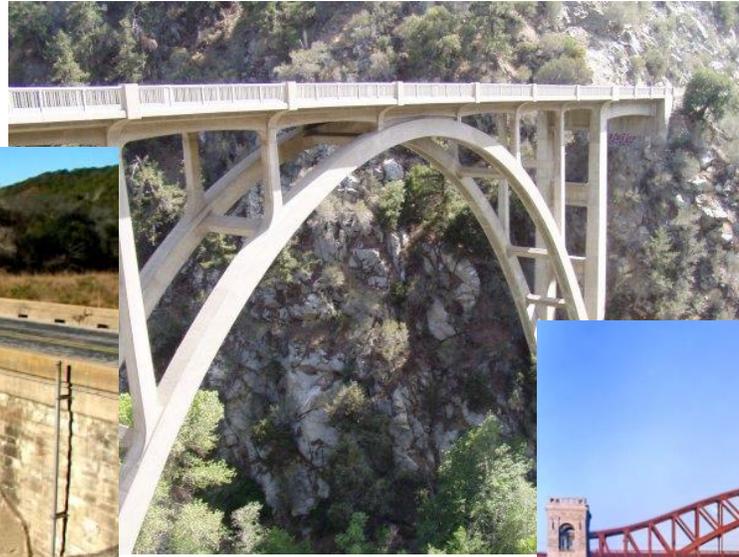
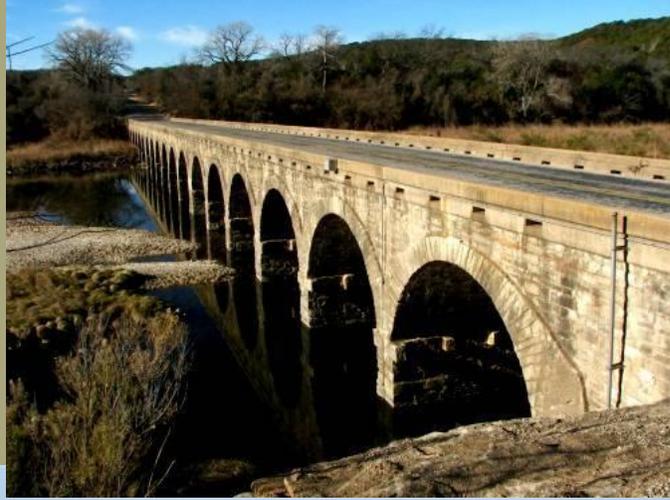




History of bridges

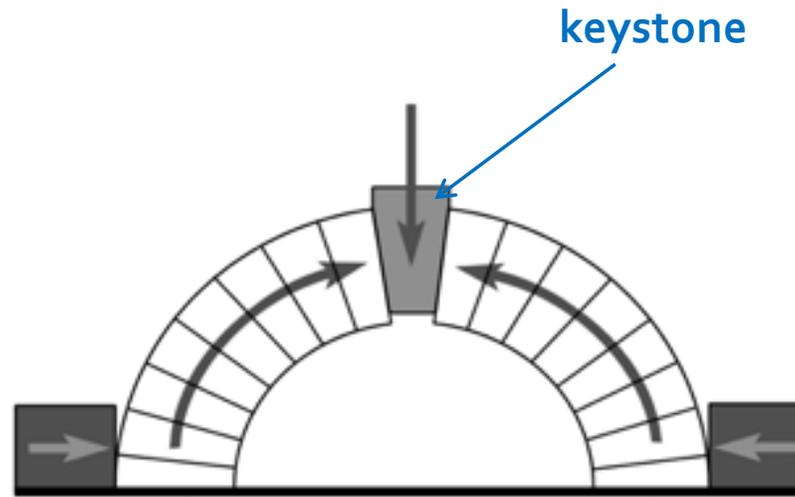
- Some of the earliest bridges were just fallen trees or logs that were positioned over small rivers and ravines (natural bridges)
- Later, bridges were made of rope and wooden boards. This type of bridge allowed for transporting materials on carts and wagons. Heavy loads were an issue however, and severe weather
- Stone arch bridges came later with the Roman Empire, and even now many Roman built bridges are still being used across the world

ARCH BRIDGE



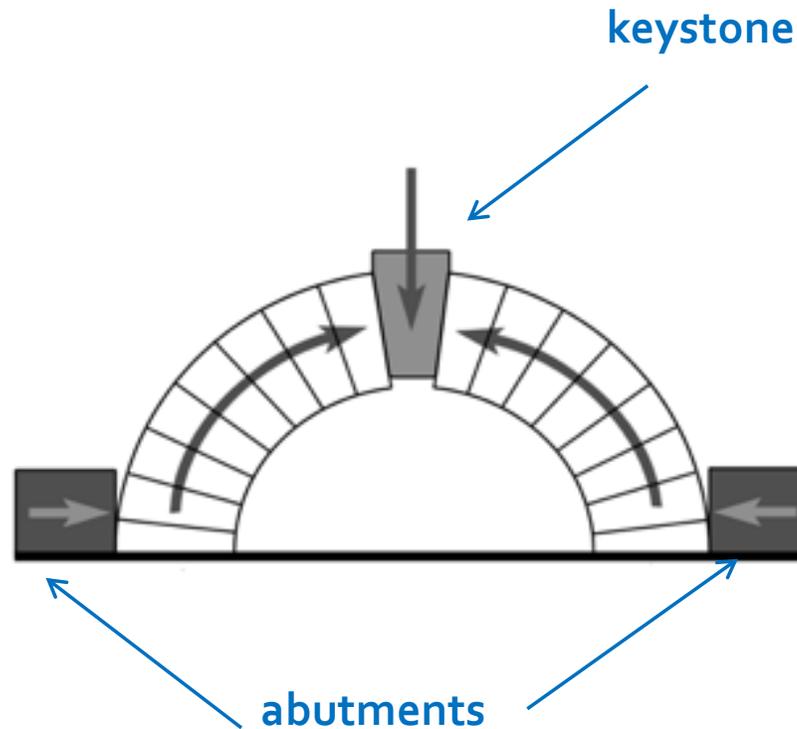
ARCH BRIDGE

- Arch bridges are built on top of a **wooden frame**. This allows the stones to be put in place. The stone in the middle of the bridge is called the **keystone** and is the most important part, without this, the arch would **collapse**. When the keystone is put in place, the wooden frame can be **removed**.



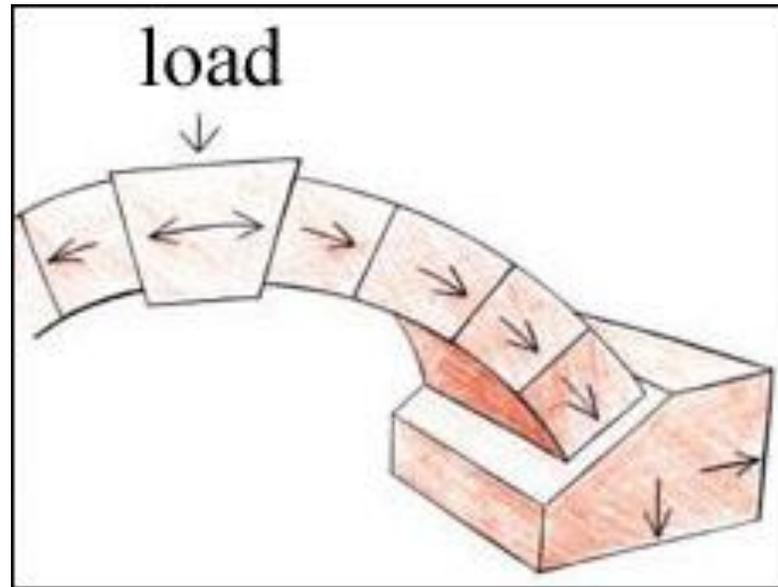
ARCH BRIDGE

- An arch bridge is always under **compression**. It works because instead of pushing straight down, the load of an arch bridge is carried out along the **curve** of the arch to the supports at **each end**. These supports are called the **abutments** and they **carry the load** and stop the ends of the bridge from spreading out.



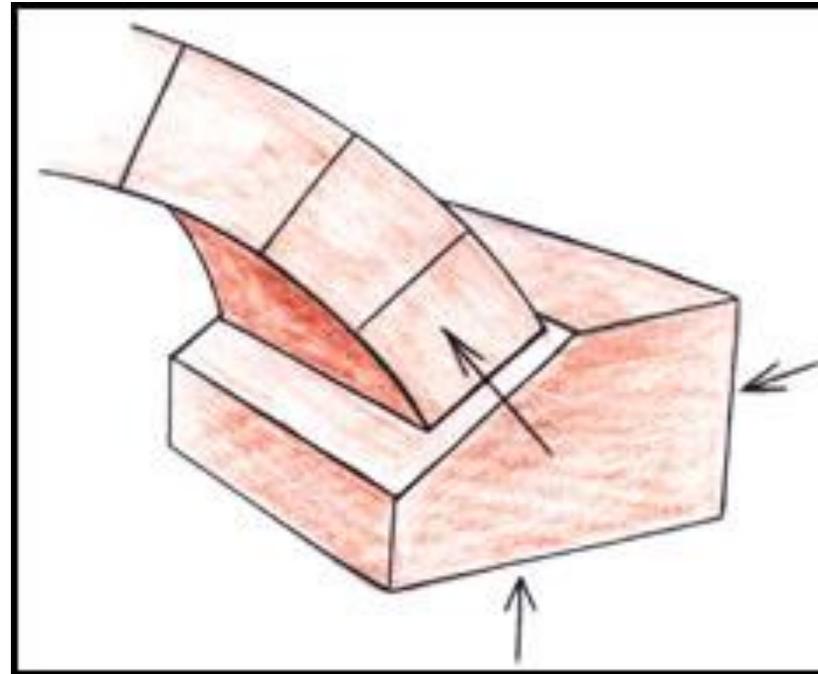
ARCH BRIDGE

- The weight from the load at the top of the **keystone** makes each stone on the arch of the bridge press on (**compress**) the one next to it. This happens until the force reaches the end **abutments** which are built into the ground.



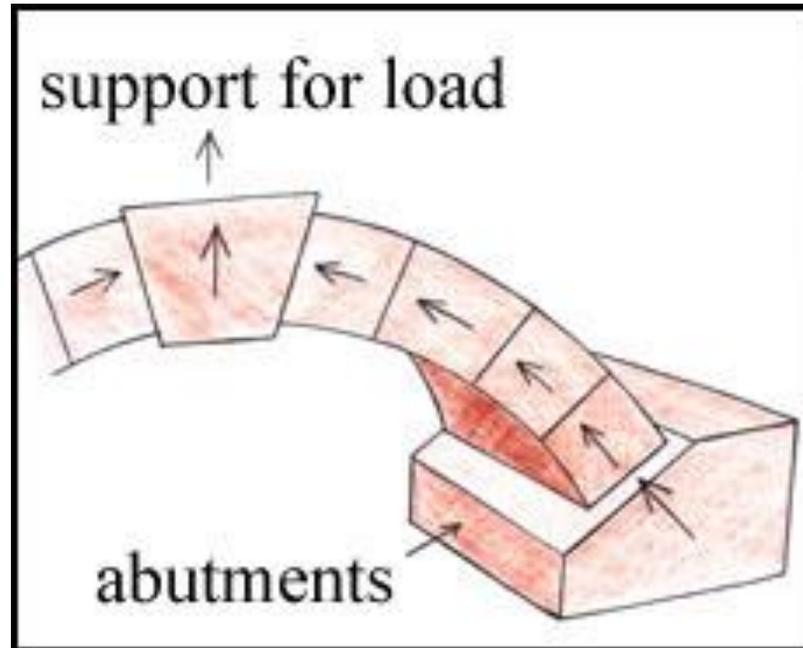
ARCH BRIDGE

- The ground around the **abutments** is squeezed and pushes back on the **abutments**.



ARCH BRIDGE

- The ground pushes back on the **abutments** and passes the force back up from stone to stone, until it is back pushing on the **keystone** which supports the load.

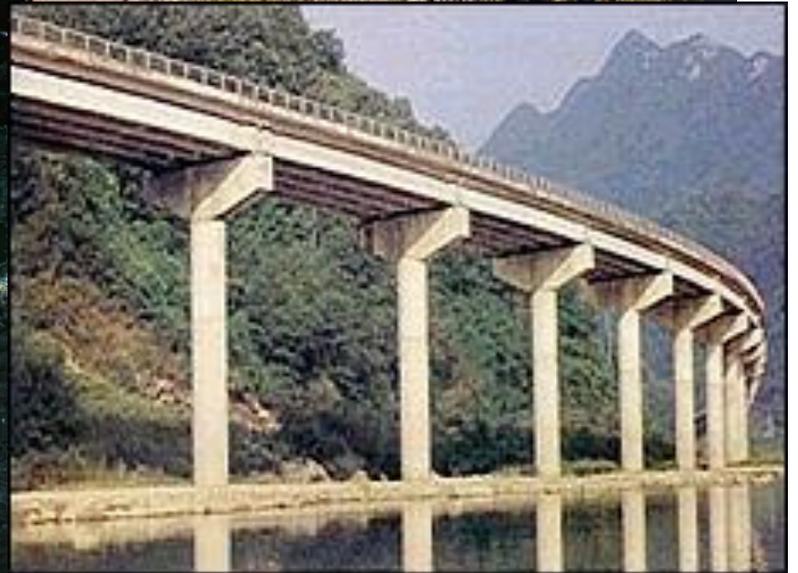


BEAM BRIDGE



A wrought-iron beam bridge

Trains run through the iron tube which forms a strong beam.



BEAM BRIDGE

- Simplest kind of bridge.
- Can simply consist of horizontal beam supported at each end by pillars.



- Must be stiff – resists twisting or bending under load.
- Normally cover short distances. Longer = weaker.

BEAM BRIDGE

- It is just one **beam** that stretches across a gap in the landscape and is supported by **columns**.

column



BEAM BRIDGE

- The weight of the **beam** pushes straight down onto the **columns** but the **beam** needs to be able to **support the weight** of the loads when they are between the **columns**. The further apart the **columns** are, the **stronger** the **beam** needs to be. For this reason, the beam bridge is usually used to span **shorter distances**.

column

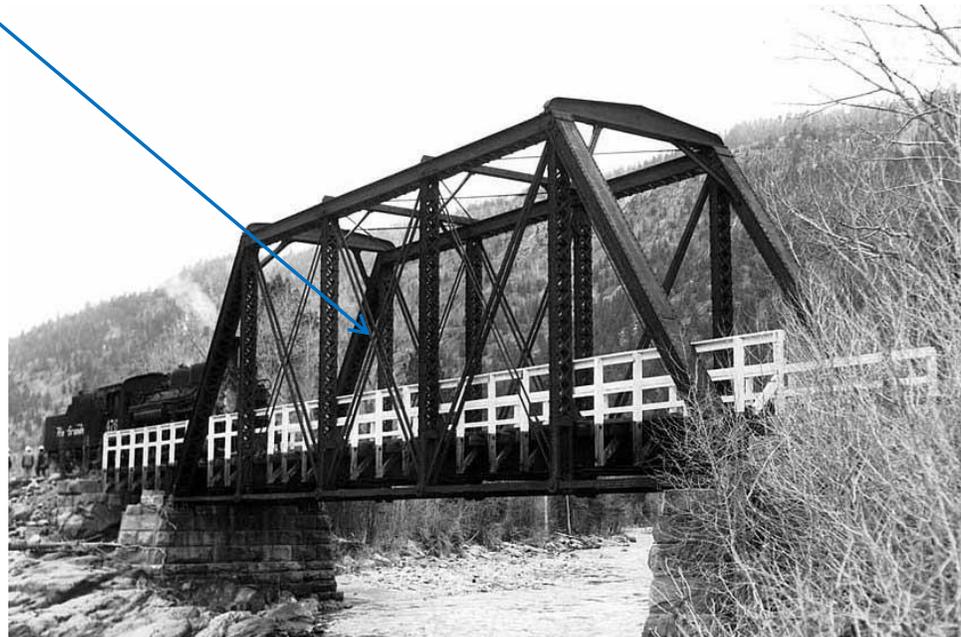


beam

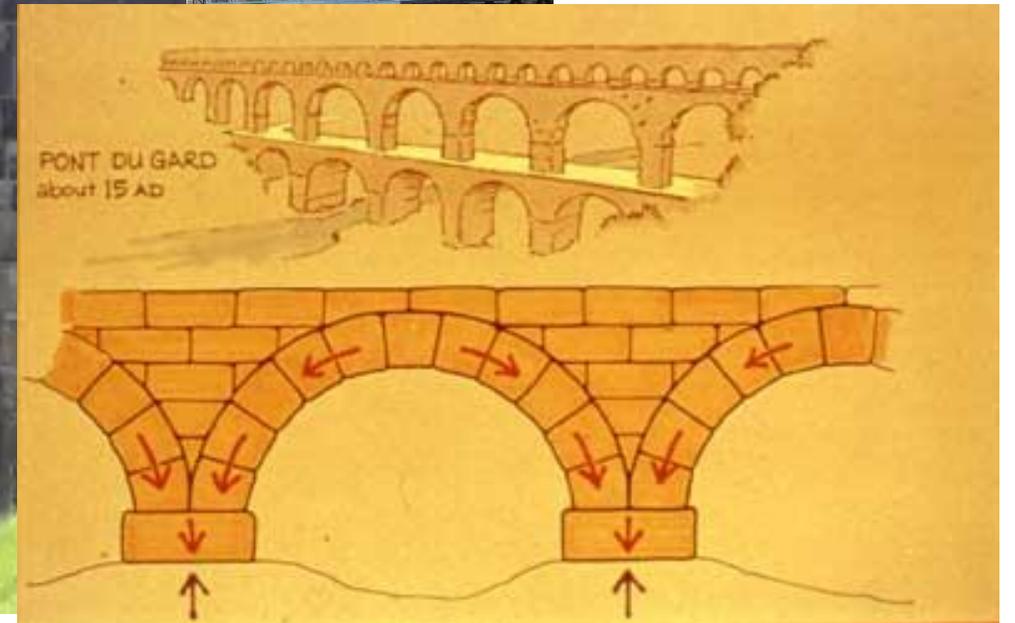
BEAM BRIDGE

trusses

- To make a longer beam bridge, engineers can do a few things e.g. join a few beam bridges together or use **trusses**.

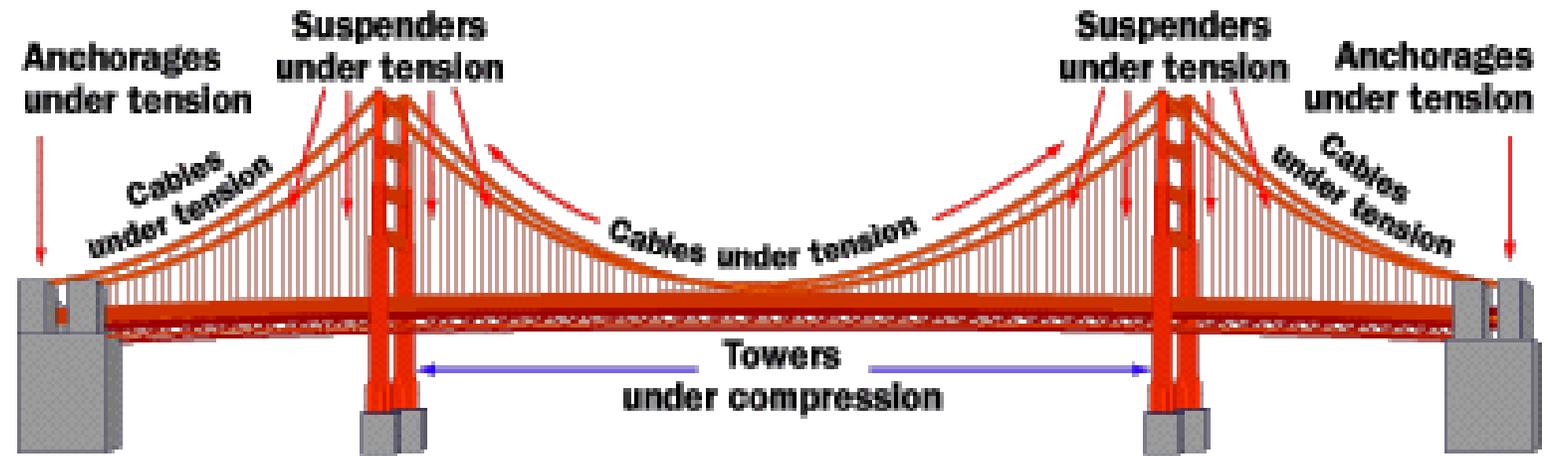


Can you spot
any keystones
or abutments
on these arch
bridges?



SUSPENSION BRIDGE

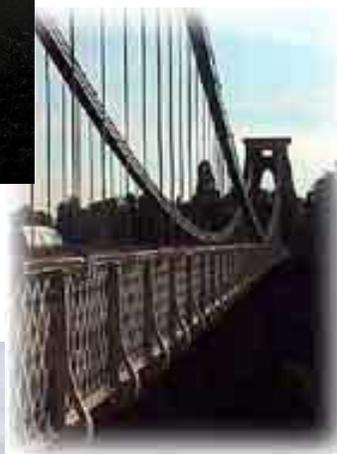
- Originally made from rope and wood.
- Strong and lightweight.
- Most expensive type of bridge to build.
- Suspend the roadway from huge main cables.



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- Cables extend from one end to other.
- Cables rest on high towers and must be secure.
- Built to cover long distances.
- Most famous and beautiful bridges.
- Weight of bridge is distributed safely and evenly.

SUSPENSION BRIDGE



Now try this game on
the iPads!

<http://www.pbs.org/wgbh/buildingbig/bridge/challenge/indexp.html?l>

Your Challenge!

Each person will have to construct a bridge design of their choice, but it must meet the following criteria:

- It must not be over 40cm long, and be able to cope with increasing weight without being supported to the side (allow for 5cm either side to rest on blocks)
- The bridge is not allowed to be more than 30cm high
- The inside width of the bridge must be no more than one 15cm wide

Bonus marks for:

Design – building based on a particular bridge type – independence– creativity

A Taste for Bridges: Types of Bridge

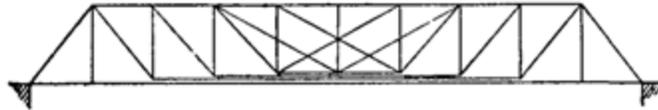
Arch



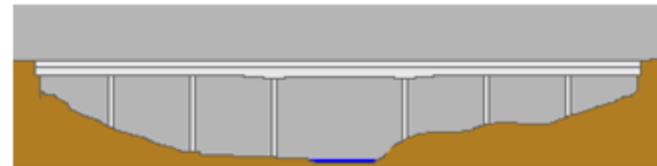
Suspension



Truss



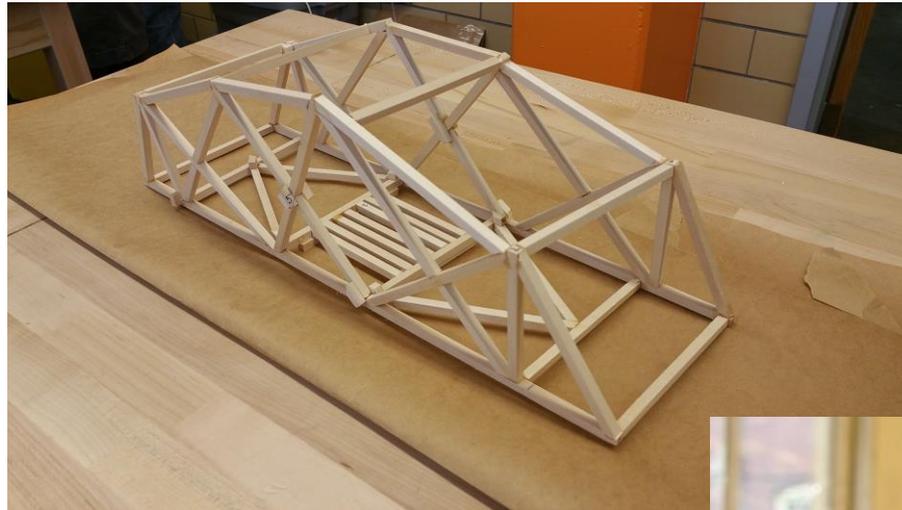
Beam



Which type of bridge will you build?

Your first task, is to sketch out your plan onto the planning sheet!

Consider the resources in your pack before making any final decisions!



- Consider your resource pack before designing

- Are you going for style or stability?



- Doesn't this one look amazing!

Judge's Criteria

Company Name	Inspired by which bridge design	Independence	Aesthetics	Strength	Design



Consider the key areas outlined above to ensure you score the highest rating from your teacher!