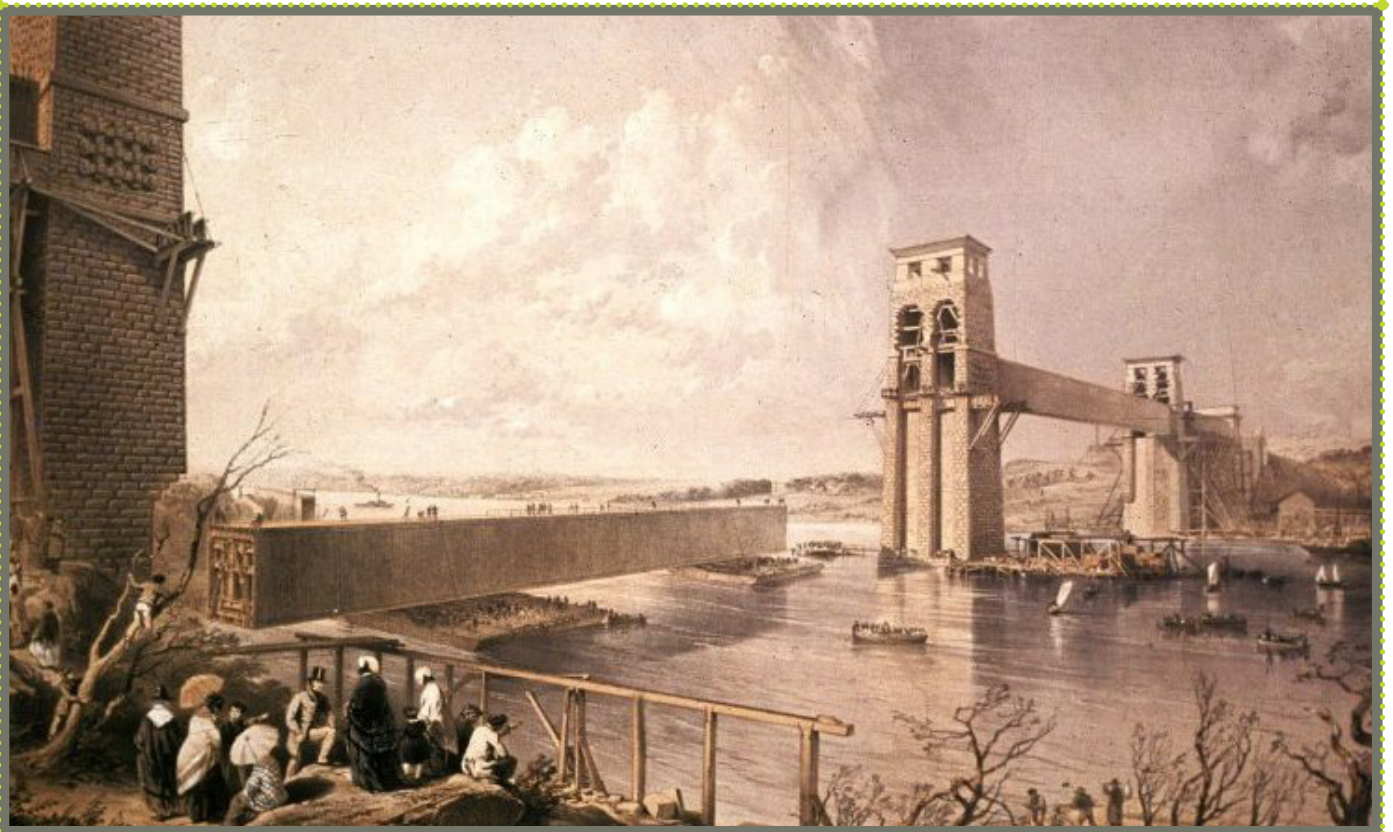
BRIDGES FACT FILE 01

Type
Box girder bridge

Name
Britannia Bridge

Lead engineer
George Stephenson

Opened in 1850, destroyed by fire in 1970.



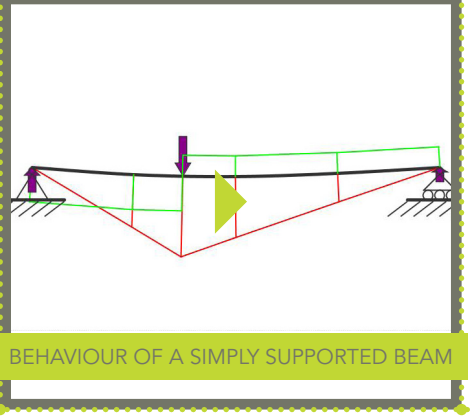
This bridge was designed to carry the railway from Anglesea to mainland Wales.

To build a structure across such dangerous waters, the engineers built each box girder section on the shore, and then floated out to the bridge piers and lifted it into position.

BOX GIRDER

The Britannia Bridge was the first example of a box girder bridge. A box girder is a rectangular tube made of iron or steel.
In this example the train travels inside the girder.

The girder is an example of a simply supported beam.



BEHAVIOUR OF A SIMPLY SUPPORTED BEAM

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BRIDGES FACT FILE 02

Type
Suspension bridge

Name
Golden Gate Bridge

Lead engineer
Joseph Strauss

Construction started in 1933, the bridge opened in 1937.

- Ideally suited to bridging long spans.
- The weight of the deck is carried by the cables to the towers. The cables must be anchored into the ground at either end, otherwise the towers would collapse.
- Very flexible: good for earthquakes; bad for wind.


TACOMA NARROWS BRIDGE COLLAPSE


FIRST SUSPENSION BRIDGE – BRUNEL


'WOBBLY' MILLENNIUM BRIDGE

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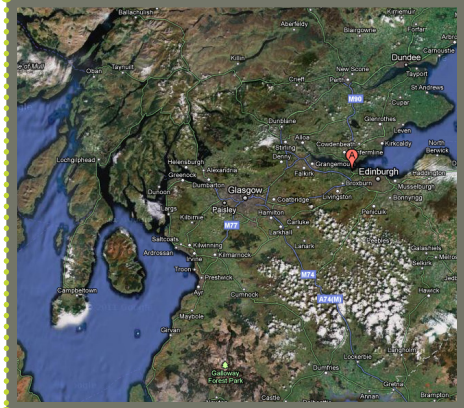
BRIDGES FACT FILE 03

Type
Cantilever bridge

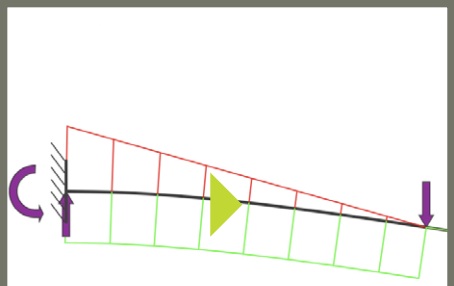
Name
Forth Rail Bridge

Lead engineers
Sir John Fowler
and Sir Benjamin Baker

Opened in 1890.



- The weight of the structure is balanced around a central point, like a see-saw.
- Built from the middle, going outwards, with new pieces added to each side so the weight is balanced.
- The Forth Rail Bridge has three cantilever structures, linked by two 'mini' bridges.



BEHAVIOUR OF A CANTILEVER BEAM

HUMAN MODEL CANTILEVER BRIDGE

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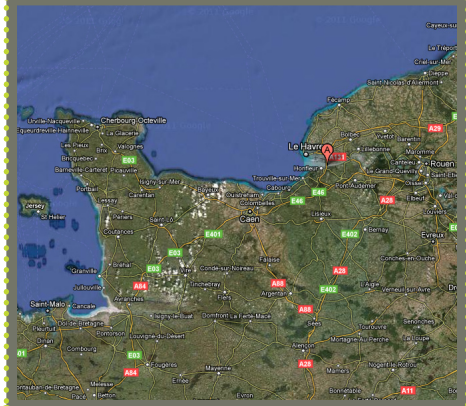
BRIDGES FACT FILE 04

Type
Cable-stayed bridge

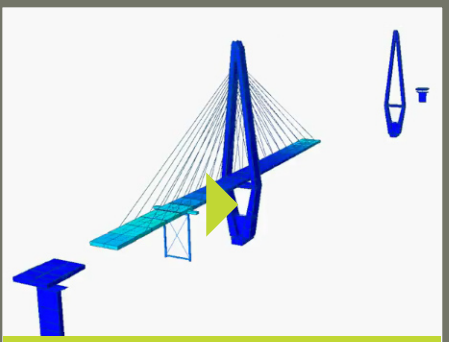
Name
Pont de Normandie

Lead engineer
Michel Virlogeux

Construction started in 1988, openend for traffic in 1995.



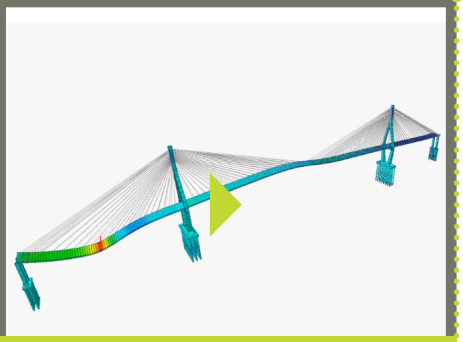
Like a cantilever bridge the weight on one side of each tower is balanced by the weight on the other, which means they do not require cables to be anchored at either end.



CONSTRUCTION CABLE-STAYED BRIDGE

Compared to suspension bridges, cable-stayed briges are cheaper to build and are more steady in high winds, but are less well suited to long spans.

Cable-stayed bridges can be harp or fan design. The Pont de Normandie is an example of harp design.



MOVING LOAD ON CABLE-STAYED BRIDGE

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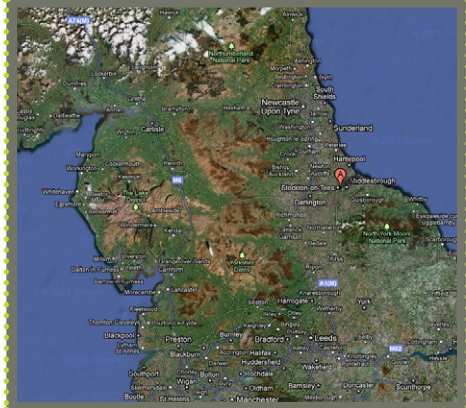
BRIDGES FACT FILE 05

Type
Tied-arch bridge

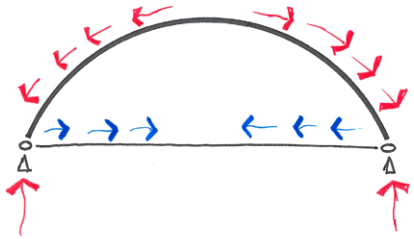
Name
Infinity Bridge

Lead engineers
Expedition Engineering

Construction started in 2007,
The bridge opened in 2009.



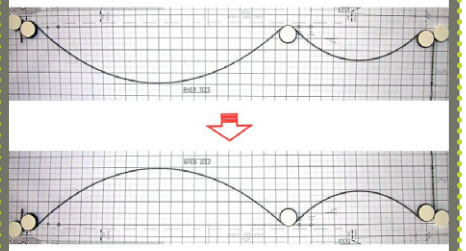
The Infinity Bridge has two tied arches joined together. Unlike a regular arch bridge, where the outward forces of the arch are resisted by strong foundations, here the outward forces are resisted by a tie linking the ends together, like an archer's bow, so the bridge doesn't need massive foundations.



TIED-ARCH PRINCIPLE

In 1671 Robert Hooke discovered that a heavy chain hung between two points will make the mirror image of a perfect arch.

The Infinity Bridge's engineers used a chain model to help find the ideal form for the two arches of the bridge.



CHAIN MODEL USED FOR DESIGN

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