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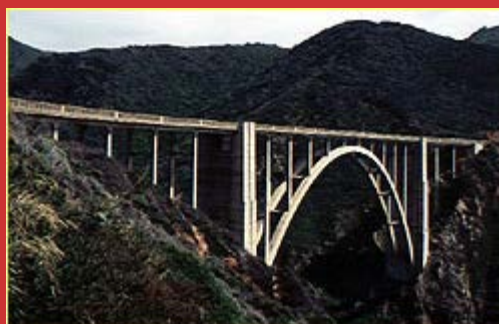
SITE MAP

HOME SECRETS OF LOST EMPIRES

China Bridge

Arch Bridge

Arch bridges are one of the oldest types of bridges and have great natural strength. Instead of pushing straight down, the weight of an arch bridge is carried outward along the curve of the arch to the supports at each end. These supports, called the abutments, carry the load and keep the ends of the bridge from spreading out.



Arch Bridge
Bixby Creek Bridge, Monterey, CA

Try It!

How do the abutments support an arch bridge?



Cut a strip of cardboard that's about one inch by 11 inches. Gently bend the strip so that it has a curve.

Position the cardboard on a table so that it resembles an arch. Press down on the center of the arch. What happens to the ends of the cardboard?

Next, place a stack of books at each end of the arch. Press again. Now what happens? Notice how the stacks of books act as abutments, keeping the ends of the arch from spreading apart.



When supporting its own weight and the weight of crossing traffic, every part of the arch is under compression. For this reason, arch bridges must be made of materials that are strong under compression.

The Romans used stones. One of the most famous examples of their handiwork is the Pont du Gard aqueduct near Nîmes, France. Built before the birth of Christ, the bridge is



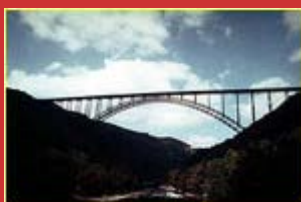
The Pont du Gard aqueduct

held together by mortar only in its top tier; the stones in the rest of the structure stay together by the sheer force of their own weight.

The ancient Chinese used an elegant variation of the arch to build the unique Rainbow Bridge, somewhat of a mystery to engineers today. This unusual arch bridge consists of short pieces of timber woven under and over cross-beams and then lashed together with bamboo straps. The bridge's graceful arch allowed bustling commercial river traffic to pass underneath it.



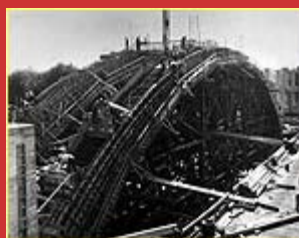
The wooden rainbow bridge depicted in this painting is no longer built in China.



The New River bridge

Today materials like steel and pre-stressed concrete have made it possible to build longer and more elegant arches, including a spectacular 1,700-foot span in New River Gorge, West Virginia. (More typically, arch bridges span less than 800 feet.)

Constructing an arch bridge can be tricky, since the structure is completely unstable until the two spans meet in the middle. One technique is to build elaborate scaffolding, or "centering," below the spans to support them until they meet. A newer method supports the spans using cables anchored to the ground on either side of the bridge. In situations where there is an active water- or roadway below, this method allows contractors to build without disrupting traffic.



Centering under construction



One of the most revolutionary arch bridges in recent years is the Natchez Trace Bridge in Franklin, Tennessee, which was opened to traffic in 1994. It's the first American

Arch construction using
cable supports

arch bridge to be constructed from segments of pre-cast concrete, a highly economical material. Two graceful arches support the roadway above. Usually arch bridges employ vertical supports called "spandrels" to distribute the weight of the roadway to the arch below, but the Natchez Trace Bridge was designed without spandrels to create a more open and aesthetically pleasing appearance. As a result, most of the *live load* is resting on the crowns of the two arches, which have been slightly flattened to better carry it. Already the winner of many awards, the bridge is expected to influence bridge design for years to come.

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The Natchez Trace
bridge

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