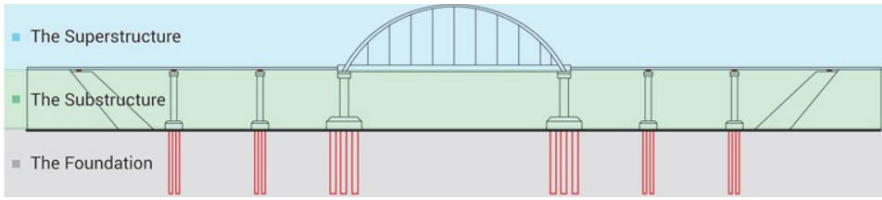
Main Parts of a Bridge – Explained

- When you cross a bridge, do you ever stop to wonder how it's made?
- If you're curious about the main parts of a bridge and what their purpose is, you'll want to keep reading.
- This article looks at the foundation, substructure, and superstructure of a bridge, and the main components that make up each key area.

What are the main parts of a bridge? Many of us use bridges everyday, but have you ever stopped to consider what makes up the various parts of a bridge?



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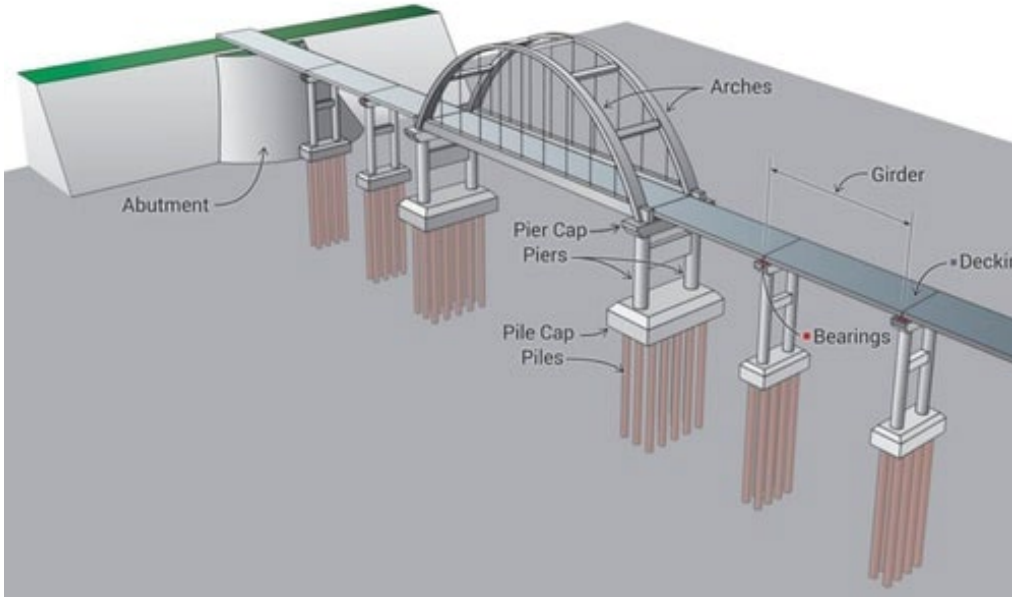
Bridges are usually built when there is a need to cross over a road, railway, or water channel. Many large and small bridges have been built throughout history to cross over barriers and obstacles. The type of bridge that's built depends on the specific physical and design scope requirements. Hence, a bridge can be the smallest plank used to cross over a stream, or a large structural span built for traffic to travel over a wide river.

The main components of a bridge are the foundation, substructure, and the superstructure. Each of these core areas have other parts within them. Piles and pile caps are constructed as the foundation of the bridge. The sub-structure includes piers and abutments, while the superstructure includes the girders, bearings and deck.



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When building a bridge, the construction starts with laying the foundation. Then the sub-structure is made to give support for the heavy superstructure above it, which is actually used as the road or walkway

Main Parts of a bridge

Let's look at the main parts of a bridge in more detail and consider the components that make up the three core areas:

The Foundation

Piles: Piles are usually laid to give support to a bridge and make up the initial foundation. The piles help the weight and stresses applied by the bridge to be transmitted evenly through the ground making it stable and strong.

The material and design of a pile depend on several factors such as soil type, ground instability and load bearing capacity constraint. For bridges on rivers, scouring is also considered before the bridge is designed.

Caps: Caps provide additional load transferring capacity to the piles. They are also known as pile caps as they are placed right on top of the pile foundation. Caps are often made of very heavy concrete to give maximum strength to the upper part of the bridge.

Bents: When piles and caps are set together they are called bents. Multiple bents form the foundation for the substructure.

The Substructure

Abutments: Bridges have vertical supports at their approaching ends, functioning as retention walls for the ground. These are built from reinforced concrete and are capable of withstanding high levels of horizontal force.

Piers: When there are multiples spans in a bridge, then piers are mounted at the end of each to give sustenance from forces and vibrational effects, acting as supporting points for the bridge.

Pier Caps: Pier caps are also known as the headstock. This functions as a space for girders to transfer loads on bearings (that divide the load among all the piers), from the superstructure components on the top.

The Superstructure

Girders: Girders joins all the pile caps together by extending over them. Girders are also referred to as beams, and give support to the deck. This can be a single span, or even multiple spans joining all the bents, dependent on the length of the bridge. Girders usually have a truss design to improve stress and load resistibility. Hence, pressure is quickly passed towards the foundation. Girders are mostly made from metal or concrete.

Bearings: Bearings are structural members capable of transferring loads from the deck to the substructure. These displace stresses and load to the piers through the girders to allow movement between parts of a bridge. The movement can be linear as well as torsional. Bearings provide allowance between these parts.

Trusses: Trusses are made by joining triangular components to divide loads and bending moments through the bridge. Some types are simple trusses, suspension, and also cantilever trusses. The truss network provides a surface for transportation which can be built as a deck truss, pony truss, or through truss. Each truss differs in how the traffic will move on the bridge.

Decks: Decks get the direct traffic load. Some basic decks can be made of concrete and also from metal. These include travel or walking paths, drainage systems, curbs, expansion components, sidewalks and approach slabs.

Barriers: Mainly as a safety and protection feature, bridges have barriers on the sides of their decks. These can be specially designed fixtures, ropes, rails, fences, or concrete walls for better aesthetics.

Arches: A bridge with arches has a lot of strength. Arches can help control the safety and load bearing ability of the bridge. The quantity of arches and materials used for construction is very important. A space connecting the bridge pillars and deck beam is called the spandrel. There can be open or closed spandrels depending on the arch design.

Bridge Design

Bridges play a key role in transportation. As such, complex calculations and in-depth feasibility analysis are carried out before the design for a bridge is finalized. Aspects like the environment, load capacity, soil type and preservation, material, construction methodologies and techniques all need be taken into consideration when planning a bridge.