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Bridge Building Contest Report

Submitted to the contest

Bridges are great and massive structures that are vital for travel. They are formations that people and vehicles use to go over places to make it easier when traveling. They are made over rivers, lakes, ravines, canyons, railroads, and highways. Bridges have to be strong to support it and other vehicles. They also must be able to endure natural events.

### History of Bridge Building

The Romans built a masonry arch bridge by putting large stone blocks against each other. The middle stone at the top of the bridge was called the keystone. The Pons Fabricius Bridge in Rome is probably the only masonry arch bridge in existence. It was made in 62 BC and has two arches that are 78 feet. A tiny arch in between the two huge arches takes out water when it floods.

It was a great bridge and it took centuries before Europeans starting bridge building again. In the 1300's, priests started to control bridge building because they found the good uses of using them for communication and society. A bunch of French priests started the Freres du Pont to make strong and durable bridges. One of their best bridges was made in 1177 and was caked the Pont d' Avignon. There were twenty-one arches and some of the biggest ones were about one hundred and ten feet long! Peter de Colechurch made the first ever stone bridge towering over the Thames River. It was also known as the well-known London Bridge. Giovanni Giocondo made one, and he used a segmental arch in his bridge.

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Up until the 1800's, priests and architects kept making bridges. But, making them was complicated yet needed and could be made by amateurs. In 1716, the French engineers dominated and were the main people building bridges.

### Description of Bridges

**Girder Bridge:** This type of bridge is one of the simplest kinds. From the 1910's to 1950's, the most usual type of bridge on highways was the steel girder bridge. After World War II and more highways were built, these bridges were an everyday thing. An example could be a log across a creek. The most usual girder bridges are the I-beam girder and the box-girders. The span of the bridge can be from about ten meters to two hundred meters. The longest one is the Ponte Costa e Silva in Brazil, which is 700 meters long.

**Arch:** Arches are the next oldest kinds of bridges. The load of the bridge is taken out by along the arch to the support and the weight is moved to the supports at the corners. These supports, also known as abutments, take the weight and stop the bridge from spreading out. Arches were made of stone, but now there are also concrete and steel arches. There are still many old but great examples of stone arch bridges in existence today. Arches are good for going over valleys and rivers and need piers. They are very strong and wonderful bridges. The longest one is the New River Gorge Bridge in U.S. It is 924 meters long.

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**Truss:** This type of bridge has a very thin structure. The way it's designed is that the parts are focused to tension and compacted forces and not ones that can curve. All the beams are straight. In a truss, there are lots of tiny beams that hold up a great weight and have great lengths. The design is somewhat simple but once trusses are created, they take up lots of room and can even distract drivers.

**Suspension:** Out of the many bridge kinds, the suspension bridge lets it have the lengthiest spans. They can span from 70 -1,000+ meters. People usually think that suspension and cable-stayed bridges look alike, but they are very diverse. They are well used today but they have been used for a very long time. Some suspension bridges have vines and ropes for cables. The world's longest suspension bridge is the Akashi Kaikyo Bridge in Japan which is 3,911 meters long!

### The Basic Elements of Bridge Design

A person must first be able to find the geometrics of a bridge as well as think about many elements of designing bridges. There are about two ways to view bridges. In terms of a regular driver of a car or other forms of transportation, going over the deck, the driver will see the travelway, the railings, and an outlook of each side. If the bridge goes over one more street, one can see the water and/or land on the sides and the bottom can be seen from this view point. Bridge designers must remember that these two different view points may mean that they have to think about more visual actions done for the bridge.

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The basic principles of bridge design are tension, compression, and counterbalance. For the bridge deck, the big parts are the width of the travelway, shoulder, parapet, and other non-transportation-related items. Other important parts are also the railings, lighting fixtures, and more. For one side of the bridge some big parts are the piers, the fascia, abutments, and wing walls. Also, the railings and other fixtures from the peak of the bridge will be very important for the side, because they can be seen from the base.

### My Design

I chose to build the arch bridge for many reasons. One reason is that arches have a lack of tension so it can go greater distances than beam bridges. Also arch bridges can be made with parts that have less "tensile strength". So, arch bridges are really strong and are safer for things with more mass. These bridges can hold more weight and the keystone supports the rest of the weight so they are reliable and more durable. Safety is always an issue in bridges, and arches are probably one of the safest kinds of bridges.

I also chose this design because it is very detailed and I like the structure. The way it is built is fascinating and appealing to the eye. Arch bridges are durable. Most real ones today are very old and have lasted the weather, vehicles, pedestrians, etc and have survived destruction. This bridge is popular and appreciated by many people. Also, since we are supposed to build a bridge that can hold the most weight, I would suppose the arch would be the best choice.