Types of bridges essay sample

There are 4 major types of bridges. We have a separate page for each type of bridge. Please go to one of the following pages. Beam – The beam type is the simplest type of bridge. The beam bridge could be anything as simple as a plank of wood to a complex structure. It is made of two or more supports which hold up a beam. Arch – In the arch type of bridge, weight is carried outward along two paths, curving toward the ground. Suspension/Cable-stayed – The deck (trafficway) of a suspension bridge is hung by cables which hang from towers. The cables transfer the weight to the towers, which transfer the weight to the ground. Cable-stayed bridges have towers, but cables from the towers go directly to the road deck, instead of spanning from tower to tower. Cantilever – In the cantilever type of bridge, two beams support another beam, which is where the deck or trafficway is. The two beams must be anchored, and this must be done well.

There are five different basic types of bridges: Beam Bridge

The “ Beam Bridge” is a good design when trying to span a short gap that is also not very high. It is supported on either end by land or tall columns. If a beam bridge must be longer, support columns can be used to maintain support throughout the span. Materials used are usually concrete and steel.

Truss Bridge

The “ Truss Bridge” is similar to a beam bridge except much stronger. These bridges use a pattern of geometrical shapes (triangles) called trusses. These trusses are very rigid (they don’t move when pushed) and, thus, make the bridge very STONG! Because of their strength, truss bridges are often used for railway bridges as they must be able to support the great mass and the vibrations of the trains. Arch Bridge

The “ Arch Bridge” is quite economical (cheap) to build. It can span a very deep chasm and maintain support throughout the span. The arch bridge is strong because no one point along the arch supports more mass than any other point – thus, the mass is spread out VERY evenly –> force spread out both downwards & outwards from the centre. Modern day arch bridges (they were used as far back as the Roman Empire!) use both steel and reinforced concrete as the basic materials. Arch bridges made of steel are constructed by joining curved beams of steel. The building process is interesting. Builders start adding the curved beams at either end of the span until they meet in the middle! Cantilever Bridge

The “ Cantilever Bridge” is constructed from two beams jutting out from either side of a riverbank or body of water (embankments). These two beams must be securely anchored into the embankments using concrete slabs called abutments. The two beams meet in the middle of the bridge. If the bridge needs to be longer, then a third beam is added between the first two and this third beam must be supported by a pair of columns or a centre pier. Look at the picture above.

Suspension Bridge

The “ Suspension Bridge” is the best kind of bridge to build when trying to span a very large body of water. The deck or roadway is supported easily by steel cables that curve from one tower to another tower.

Bridges of today show the advancements in steel technology and design which have occurred over the last century. From the modest spans to the exciting cable stayed and suspension bridges, steel has a wide appeal. Products to meet the needs of the most demanding criteria are now readily available. This section illustrates the scope and versatility that steel can offer architects and engineers for all types of bridge construction. The following table shows the most common types of bridge and typical lengths. Type of Bridge| Length Range

Multi-beam/Composite deck| 15 m < 100 m|

Box grider| 45 m to 180 m|

Truss| 40 m to 500+ m|

Arch| 30 m to 500 m|

Cable-stayed| 200 m to 850+ m|

Suspension| 850+ m|

Multi-beam/Composite decks

Multi-beam steel composite decks are very competitive for highway bridges in the span range of 15 – 100m. They comprise a reinforced concrete deck slab on top of several girders. The steel girders are connected to the concrete slab by shear connectors and the two act compositely together. For simple spans up to 25m and continuous spans up to 33m, rolled universal beams are economic and are available up to 1000mm deep. Very little fabrication is required, usually only the fitting of stiffeners for bearings & the attachment of bracing, and sections may be bent to provide precamber and horizontal curvature. For longer span bridges, deeper girders are fabricated from plates. This gives scope to vary the web and flange sizes and the steel grades for an efficient design. Variable depth girders are often used to give greater economy, and also to enhance aesthetics. Such plate girders can be readily fabricated with curvature in plan and elevation. Box girder bridges

Box girders are a particular form of plate girder, with two webs joined by common top and bottom flanges. Boxes may be used either singly or in multiples. They may be straight or curved in plan and be of constant or variable depth. If using a concrete top flange then the box girder is called " open top". Box girders with a steel top flange (often called an ' orthotropic deck') will give a minimum weight solution, and so are generally used on long span bridges. Steel box girder bridges have great torsional rigidity, which makes them ideal for bridges that are highly curved in plan or where construction by launching is required. In addition, they are widely used as the deck elements of cable-stayed and suspension bridges, where the torsional stiffness of a box is important for the dynamics of such long span bridges. Truss bridges

A truss is a triangulated framework of elements that act primarily in tension and compression. It is a light-weight yet very stiff form of construction. Truss girders were common in early steel bridge construction as welding had yet to be developed (pre 1930s) and rolled sections and plate sizes were of a limited range. They are considered expensive to fabricate today, being labour intensive. Maintenance issues have to be carefully addressed (for example, ease of access). However, they can still show advantages in particular applications such as footbridges and railway bridges.

Typical spans in one form or other can range from 40m to 500m. Trusses may be used as girders below the deck level, or as through girders with the deck at the bottom chord level. Such through truss girders minimise the effective construction depth, and the length of approach embankments. Hence, they are particularly suited to footbridges and railway bridges. The light-weight yet stiff nature of truss bridges also makes them ideal for demountable “ Bailey” bridges. Trusses can also be used as arch elements (for example, the Sydney Harbour Bridge) and as cantilever elements (for example, Forth Rail Bridge in Scotland). They also have applications as stiffening girders on major suspension bridges. Arch bridges

In the traditional form, a steel arch has a similar structural action to old masonry arch bridges. The arch springs from the foundations and exerts horizontal thrusts on them. The arch elements act primarily in compression. The deck may either be supported on struts, resting on arch below, or it may be suspended on hangers from the arch above. A tied arch or “ bow string” arch is a particular development of the arch form. The horizontal thrusts from the arching action are resisted by tension members between the arch springings. Effectively the deck acts as a tension tie, and is supported by hangers from the arch above. This form is suited to the soft soils of river banks, where the ground cannot withstand the large horizontal thrusts from arching action. Steel arches in one form or another have been used for spans ranging from 30m to 500m. Cable-stayed bridges

Cable-stayed bridges are a recent adaptation of the suspension bridge principle. The deck structure is supported by tension stays sloping from one or more towers. There may be either a single plane of stays down the centre of thd bridge, or two planes; one on each side of the bridge. The towers act in compression and can have a variety of forms (A-frame, H-frame or columns). The deck girders sustain compression forces as well as bending forces. Economic spans range from 200m to over 850m, and as such cable-stayed bridges fill the gap between large arches / trusses and small suspension bridges. The very large spans have only recently been feasible due to developments in dynamic analysis, and methods for damping oscillations. On a more modest scale, they are also suitable for footbridges > 40m span, to provide stiffness and support to an otherwise flexible light-weight structure. In terms of aesthetics, the low profile decks, striking towers and raking cables are effective and dramatic. Such bridges are usually landmark structures. Suspension bridges

The deck of a suspension bridge is supported by vertical tension hangers, which are supported in turn by large tension cables extending over two towers from anchorage to anchorage. The suspension concept dates back to antiquity, and it is because of their fundamental simplicity and economy of structural action that suspension bridges are used for the longest of modern bridge spans. A stiffening girder running the full length of each span is an essential part of a suspension bridge. It distributes the concentrated traffic loads and provides stiffness against bending, twisting and oscillation. For single decks, the trend is to use box girders to minimise weight and give maximum torsional stiffness. However, where twin level decks are required (for example, to carry road traffic and railway traffic) then the general trend to use truss girders. Aesthetically, the graceful curve of the suspension bridge combined with the strong visual line of the deck give a pleasing effect. The combination of grace and grandeur in such situations leads to the acknowledged view that many of the world’s most exciting bridges are suspension bridges.

Drawbridge: The term is used to refer to a bridge-like structure which is movable. Typically, a drawbridge opens up to extend over the distance it is meant to span. A castlebridge, for example, opens like a door, serving as a doorway to the castle. It could be in the form of a plank that is pivoted to the center that rotates along a designated circumference.