

## Structural Engineering Insight: How are bridges built?

Some things in life, even when explained to us, defy human logic. A plane maintaining height in the sky, buildings that can withstand freak weather and bridges that are suspended high and wide across plains of water.

The process of bridge construction has been made much easier in recent years by technological and scientific advancements, but yet this process still baffles many of us. So how exactly are bridges made?

- **Planning**

You can't just go in all guns blazing when undertaking a project such as a bridge build. Often, the planning stage is the most involved with numerous people and services being privy to the ongoing process. Things that are considered early on are the characteristics of the bridge, the site details and the requirement of resources. The bridge design will be determined by the type of bridge being constructed - the main types of the bridges are beam, arch, truss, cantilever, and suspension. Each bridge type has different things that need to be considered - for example, a beam bridge (the most common style of bridge) is build entirely differently to a suspension bridge. It is also integral that the purpose of the bridge is taken into consideration - road and rail bridge, pedestrian pavement, material to be used like steel or concrete, and fixed or moveable.

- **Foundations**

Ensuring that a solid, functional and appropriate foundation is laid for the bridge is a significant part of the build. This process involves detailed geotechnical investigations of the bridge site as well as choosing the bridge foundation, such as the well foundation, pile foundation, and the opened foundation. This base for the bridge is created with the integrity to withstand the bridge itself as well as technical requirements, aesthetic reasons, and the construction methodology.

- **Construction Equipment**

As with any project, large or small, it's so important to select the right tools for the job. Where bridge construction is concerned, heavy equipment will need to be sourced to ensure the smooth running of the process as it will be used extensively during the construction including bulldozers, excavators, asphalt mixers, formworks, and fabrication equipment. If the bridge is to span water, barges or pontoons may be used to float materials out to the lifting position. Alternatively, cantilever launching may be used, where the beam is launched from one bank, with sufficient ballast to counteract the overturning force, and hauled across the span using a winch.

- **Bridge Testing**

As with any man-made product, a bridge is as susceptible to human error as any. It is absolutely integral that proper bridge tests are carried out in terms of: the ability to endure normal vehicle loads and other forces created due to winds and earthquakes. Thanks to technological advancements, computer aided design and testing is something that we now have access to and can be used efficiently when testing the durability of a bridge. Not only this, but wind tunnels (used primarily for the analysis of aircraft designs) are being utilised to test bridge integrity.