Unit 202: Changing practices over time

The Menai Suspension Bridge (Learner)

The Menai Suspension Bridge, designed by Thomas Telford, spans the Menai Strait between the island of Anglesey and the mainland of Wales. The construction of the bridge, which took place between 1819 and 1826, relied heavily on manual labour and basic hand tools. The bridge was built using stonemasonry and wrought iron, which was a new material at the time. The towers of the bridge were constructed using local Penmon limestone, while the chains and cables were made of wrought iron.

The construction of the Menai Suspension Bridge faced several challenges, including the need to withstand the forces of nature, the use of wrought iron for the chains and cables, the construction of the tower foundations and the need for new construction techniques. Despite these challenges, the bridge was successfully completed and remains an important landmark and engineering achievement to this day.

Excavation and ground preparation were critical elements in the construction of the bridge. The towers had to be constructed on bedrock, which required extensive excavation and ground preparation. The site was also prone to flooding, which made it difficult to work on the foundations. To overcome these challenges, Telford used a cofferdam to create a dry working area around the base of the towers. A cofferdam is a temporary enclosure made of steel sheet piles, which are driven into the ground to create a watertight barrier. Once the cofferdam was in place, the water inside was pumped out, creating a dry working area.

The ground inside the cofferdam was excavated to a depth of around 15 feet until solid bedrock was reached. The excavation work was carried out using hand tools, such as picks and shovels. The workers also had to be careful not to damage any of the underlying bedrock, which could compromise the stability of the tower foundations. Once the bedrock was reached, the surface was levelled and smoothed using chisels and hammers. The workers then set the first layer of stone blocks, which were cut and shaped onsite by skilled masons. The stones were set using a lime-based mortar, which was mixed onsite.

To anchor the scaffolding used to erect the towers, iron pins were driven into the bedrock. These pins were then used to support wooden beams, which formed the base of the scaffolding. The scaffolding was constructed in a series of stages, each one higher than the last, until the towers were complete.

The use of wrought iron for the chains and cables was also a major challenge. Telford had to design the chains to be strong enough to hold the weight of the bridge, but also flexible enough to withstand the forces of wind and current. The Menai Suspension Bridge was the first major suspension bridge of its kind and required new techniques for its construction. For example, Telford designed a hydraulic crane to hoist the heavy stones into place. The chains were also assembled onsite, link by link, which required a high level of precision and skill.

In summary, the construction of the Menai Suspension Bridge faced several civil engineering and groundworks challenges, including the design of the bridge to withstand the forces of nature, the use of wrought iron for the chains and cables, the construction of the tower foundations and the need for new construction techniques. The excavation and ground preparation work for the Menai Suspension Bridge was challenging due to the need to work on bedrock, the risk of flooding and the lack of power tools. However, the use of a cofferdam allowed for a dry working area to be created, and skilled workers using basic hand tools were able to excavate and prepare the site for the construction of the tower foundations. The use of iron pins and wooden beams allowed for the safe and secure construction of the scaffolding.

Overall, the Menai Suspension Bridge is an impressive example of engineering and construction from the 19th century. Its design, materials and the techniques used were innovative and ground breaking for the time, and the challenges faced during its construction highlight the determination and ingenuity of its builders. The bridge has stood the test of time and is still in use today, serving as a vital transportation link between Anglesey and the mainland of Wales. It also remains a popular tourist attraction and an iconic symbol of Welsh engineering and history.