

Foundation Design of the Busan-Geoje Immersed Tunnel

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Summary

The Busan Geoje Fixed Link consists of an 8.2 km long motorway with two large cable stayed bridges and a 3.3 km long immersed that connects Busan with Geoje Island, the link was opened in December 2010. The design of the tunnel has presented a number of challenges, as it is one of the deepest immersed tunnels to be constructed, it is founded on a thick layer of soft clay and it is exposed to severe wave loadings from typhoons and a significant earthquake load.

This paper describes the main challenges for the foundation design and the innovative solutions that have been adopted.

Keywords: immersed tunnel; foundation; wave loading; sand compaction piles; cement deep mixing.

1. Introduction

The Busan – Geoje Fixed Link provides a road connection between the metropolis of Busan and Geoje Island. The Link comprises of amongst others, two cable stayed bridges and an under water tunnel constructed as a concrete immersed tube tunnel. The immersed tunnel has a number of special features: its length of 32 km, the water depth of over 47 m, severe exposure from typhoons and long period swell waves, a soft clay subsoil. These combined with the scale of the project make the design and the construction of the tunnel a major challenge which has entailed a number of innovations in immersed tunnel design. The project has been developed as a Public-Private-Partnership project where GK Fixed Link was awarded the concession to design, construct and operate the Link for 40 years. The GK Fixed Link Corporation is formed by 7 Korean contractors, of which Daewoo Engineering&Construction Co., Ltd. is the leading company. The design was carried out by the COWI-DEC joint venture and the overall design of the immersed tunnel is described by Jensen et al [1] together with a series of papers describing particular aspects of the foundation and marine design, [2], [3], [4], [5] and [6].

The tunnel consists of two short cut & cover tunnel access ramps and a 3.2 km long immersed tunnel (Figure 1) with the immersed tunnel formed by eighteen 180 m long concrete tunnel elements. The immersed tunnel elements are 26.5 m wide and 10 m high, with a rectangular cross-section and are cast in a dry dock on shore. They are floated out to the site, immersed to their final positions on a gravel bed in a pre-excavated trench in water depths of up to 47 m, after immersion, the tunnel is protected by backfill material at the sides and on top.

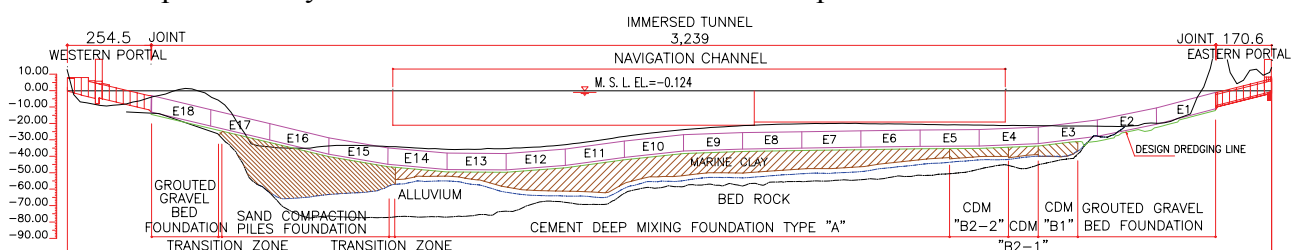


Fig.1: Long Section of the Immersed Tunnel alignment, showing foundation methods