Busan-Geoje Fixed Link

Between the major South Korean city of Busan and the Geoje Peninsula Strukton Civiel has constructed one of the world’s deepest and longest immersed road tunnels. This structure is an integral part of the new permanent connection between the two shores.

Client:
Daewoo E & C

Location:
Busan

Countries:
South Korea

Markets:
Civil infrastructure

Specialisms:
Immersion techniques
Challenge

The Busan-Geoje Fixed Link, which also traverses several other islands along the coast, is made up of cable bridges, ramps and an immersed tunnel. The tunnel starts on the island of Gaduk, crosses straits at a depth of 52.2 metres and runs for some 3.2 kilometres. It consists of 18 segments, with an average length of 180 metres.

Strukton Immersion Projects, a Strukton Civiel operating company, bore responsibility for the immersion of the tunnel segments in straits that are directly connected to both the East China Sea and the Pacific Ocean. In the course of three years the Strukton Immersion Projects team and their partners from Geocon (another Strukton Civiel company) sunk a total of 18 tunnel segments. The deepest-lying segments were positioned at a depth of over 50 metres below sea level – exceptionally deep for an immersed tunnel. The extreme weather conditions along the straits, combined with wave swells, made this a particularly challenging project for our engineers.

The Busan Geoje Fixed Link was opened for traffic in December 2010. Travel times between Busan and Geoje have been reduced from more than 2.5 hours to a mere 40 minutes.

This was a relatively large assignment for Strukton Immersion Projects: the contract amount for the immersion operation
had been set at EUR 70m. The principal for the immersion operation was Daewoo Engineering & Construction, a subsidiary of the project PPP consortium GK Fixed Link Corporation.

Our honest and transparent approach, specialist expertise, level-headed attitude and trustworthiness ultimately convinced the client to adopt our plans.

“We like the Dutch approach.”

Mr Yang, General Manager of Daewoo E&C

In the spotlight

Innovations

In order to increase the safety and feasibility of our projects and further reduce lead times Strukton has developed the following innovations:

External Positioning System (EPS)
Two hydraulic sea-legs that can grip an immersed segment and ‘walk’ across the sea floor, allowing the operator to position the segment to an accuracy of a few millimetres.

New immersion measurement systems
The operator uses a tautwire to measure the segment’s distance to the previously immersed segment. In addition, distances are surveyed with the aid of acoustic signals (SSBL). The strictest measurement requirements are satisfied with the help of distance sensors.

Steel bulkheads
The bulkheads that seal off the tunnel segments are constructed from steel, making it easy to remove them after installation. Rather than having to chip away at a concrete bulkhead, the contractors can simply disassemble the steel version. This yields tremendous time savings.

Self-propelled Diving Bell
A submersible that can moor at an immersed segment in the event of an underwater calamity.

Awards

In 2010 this project earned Strukton the prof.dr.ir. J.F. Agema Award, as well as an honourable mention by the jury of the 2009 Schreuder Award.

In 2011, Strukton Immersion Projects was nominated for one of that year’s International Tunnelling Awards – namely ‘Tunnelling Contractor of the Year’ – and for the 2011 Betonprijs in the ‘Hydraulic Constructions’ category.

Project location