

## Advancement of Immersed Tunnel Construction Technologies in Sub-sea Crossings

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### Summary

With the advanced technologies and the innovative solutions in sub-sea tunnel crossings in the recent years, very deep and very long sea crossings with immersed tunnelling technology under challenging ground and environmental conditions becomes feasible and competitive.

Unique design solutions and innovative construction methods are being adopted for longer and deeper sub-sea crossings by immersed tunnelling method.

Making use of advanced technologies such as BIM from preliminary design stage until end of the construction optimizes the proposed solutions and maximizes the efficiency of the engineering works.

This paper discusses about the recent advancement/improvement of immersed tunnel construction technologies applied for sub-sea crossings by giving examples from the recent mega projects.

**Keywords:** Sub-sea Crossing, Immersed Tunnel, Innovation

### 1. Introduction

The number of immersed tunnels in the world is approximately 180, including those under construction. This number is set to increase in the future. With the advanced technologies and the innovative solutions in immersed tunnelling technology, more challenging projects which comprise deeper, longer and wider immersed tunnels can be designed and constructed. Of the outstanding mega-immersed tunnel projects discussed in this paper, one has been constructed some 60m below sea-level, and one (under construction) will be 6 km in length. Some much longer immersed tunnels are planned to start in the near future.

With the help of innovative solutions in design and construction, not only deeper and longer immersed tunnels but tunnels with tighter radius and wider elements are being constructed.

In addition, submersible floating tunnels are also being considered to be built in the future which may extend the immersed tunnelling technology one more step further.

### 2. Deeper and Longer Immersed Tunnels

In recent years, with the help of advancing technology in immersed tunnelling, deeper and longer immersed tunnels could be designed and built. In addition to the immersed tunnels, submersible floating tunnels explained later in this paper are also being studied which could enable passing through deep fjords, lakes or deep sea crossings. As of 2014, including the ones which are under construction, the maximum depth and length of immersed tunnels is approximately 60m and 6km respectively. Figure 1 and Figure 2 show the deepest and longest immersed tunnels up to date.