Typical Underwater Tunnels in the Mainland of China and Related Tunneling Technologies

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Typical Underwater Tunnels in the Mainland of China and Related Tunneling Technologies

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ABSTRACT

In the past decades, many underwater tunnels have been constructed in the mainland of China, and great progress has been made in related tunneling technologies. This paper presents the history and state of the art of underwater tunnels in the mainland of China in terms of shield-bored tunnels, drill-and-blast tunnels, and immersed tunnels. Typical underwater tunnels of these types in the mainland of China are described, along with innovative technologies regarding comprehensive geological prediction, grouting-based consolidation, the design and construction of large cross-sectional tunnels with shallow cover in weak strata, cutting tool replacement under limited drainage and reduced pressure conditions, the detection and treatment of boulders, the construction of underwater tunnels in areas with high seismic intensity, and the treatment of serious sedimentation in a foundation channel of immersed tunnels. Some suggestions are made regarding the three potential great strait-crossing tunnels—the Qiongzhou Strait-Crossing Tunnel, Bohai Strait-Crossing Tunnel, and Taiwan Strait-Crossing Tunnel—and issues related to these great strait-crossing tunnels that need further study are proposed.

1. Introduction

China has ~18 000 km of land coastline and ~14 000 km of sea island coastline. There are more than 11 000 islands in China, of which 6536 have over 500 m^2 area each and 455 have residents [1]. Due to the restraints caused by the numerous bays and straits, the economic development in local areas is not very balanced and the transportation cost is high. Furthermore, China has many inland rivers, including 28 major rivers. Due to the