Postprint of TSP203 Application in Tunnel Advanced Geological Prediction

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Date: 2025-07-29T19:11:14+00:00

Abstract

The TSP203 equipment was employed to conduct advanced geological forecasting for the Heping Tunnel and Chongli Tunnel along the Taixi Railway's Taichong section. Based on analysis of existing geological data, geophysical prospecting methods were utilized to detect, analyze, interpret, and forecast the engineering geological and hydrogeological conditions ahead of the tunnel excavation face, as well as the engineering properties, location, attitude, and scale of adverse geological bodies, while proposing corresponding mitigation measures. This work provides a basis for proper selection of excavation methods, support design parameters, and optimization of construction schemes, while furnishing early warning information to prevent catastrophic accidents such as water inrush, mud outburst, and surrounding rock instability in tunnels, thereby enabling construction units to prepare contingency plans in advance and ensuring construction safety. The study investigates the convenience, stability, and efficiency of the TSP203 equipment in tunnel construction, aiming to overcome certain limitations in its application and leverage its exceptional performance in complex geological environments to reduce costs, optimize labor utilization, and better serve engineering construction projects.

Full Text

Preamble

The Application of TSP203 in Advance Geological Prediction of Tunnels

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Abstract

This study utilized TSP203 equipment to perform advance geological prediction for the Pinghe and Chongli tunnels in the Taichong section of the Taixi Railway. Building upon analysis of existing geological data, geophysical prospecting methods were employed to detect, interpret, and forecast engineering geological and hydrogeological conditions ahead of the tunnel excavation face, including the properties, location, occurrence, and scale of adverse geological bodies, with corresponding mitigation measures proposed. The prediction results provide a scientific basis for selecting appropriate excavation methods, optimizing support design parameters, and refining construction schemes, while delivering early warning information for potential catastrophic events such as water inrush, mud outburst, and surrounding rock instability. This enables contractors to develop contingency plans proactively and ensure construction safety. The research further evaluates the operational convenience, stability, and efficiency of the TSP203 system in tunneling applications, aiming to overcome its limitations and harness its exceptional capabilities in complex geological settings to reduce costs, streamline labor, and better serve engineering projects.

Keywords: TSP203; advance geological prediction; safety; efficiency

Note: Figure translations are in progress. See original paper for figures.