Intelligent Early Warning and Drainage Design for Tunnel Water Leakage: Postprint

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Abstract

This study aims to enhance the reliability and intelligent level of tunnel waterproofing systems by introducing theories regarding water leakage mechanisms, intelligent early warning technologies, and drainage design principles, investigating classification standards for tunnel water leakage and fault tree models, and establishing tunnel water leakage detection technology and intelligent monitoring and early warning systems based on 3D laser scanning. Research indicates that by employing intelligent control technologies, leakage hazards can be accurately identified and categorized early warnings can be issued; simultaneously, optimizing the design and construction techniques of drainage systems can significantly enhance waterproofing performance. The novel intelligent early warning and drainage design scheme demonstrates excellent drainage efficiency and rapid response capabilities, ensuring the safe operation of tunnel engineering projects.

Full Text

Tunnel Seepage Intelligent Early Warning and Drainage Design

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Abstract: This study aims to enhance the reliability and intelligence level of tunnel anti-seepage systems by examining seepage mechanisms, intelligent early warning technologies, and drainage design principles. It investigates classification standards for tunnel seepage incidents and develops fault tree models, while establishing a seepage detection methodology and intelligent monitoring and early warning framework based on 3D laser scanning technology. Research findings demonstrate that intelligent control technology can accurately identify potential leakage hazards and issue categorized early warnings. Concurrently,

optimizing drainage system design and construction processes significantly improves anti-seepage effectiveness. The proposed intelligent early warning and drainage design scheme exhibits excellent drainage performance and rapid response capabilities, providing a robust guarantee for the safe operation of tunnel engineering projects.

Keywords: Tunnel; Seepage; Drainage board; Intelligent early warning

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