

Risk identification, assessment and monitoring design of high cutting loess slope in heavy haul railway

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(Received November 19, 2017, Revised February 10, 2018, Accepted February 18, 2018)

Abstract. The stability of cutting slope influences the safety of railway operation, and how to identify the stability of the slope quickly and determine the rational monitoring plan is a pressing problem at present. In this study, the attribute recognition model of risk assessment for high cutting slope stability in the heavy haul railway is established based on attribute mathematics theory, followed by the consequent monitoring scheme design. Firstly, based on comprehensive analysis on the risk factors of heavy haul railway loess slope, collapsibility, tectonic feature, slope shape, rainfall, vegetation conditions, train speed are selected as the indexes of the risk assessment, and the grading criteria of each index is established. Meanwhile, the weights of the assessment indexes are determined by AHP judgment matrix. Secondly, The attribute measurement functions are given to compute attribute measurement of single index and synthetic attribute, and the attribute recognition model was used to assess the risk of a typical heavy haul railway loess slope. Finally, according to the risk assessment results, the monitoring content and method of this loess slope were determined to avoid geological disasters and ensure the security of the railway infrastructure. This attribute identification- risk assessment- monitoring design mode could provide an effective way for the risk assessment and control of heavy haul railway in the loess plateau.

Keywords: loess cutting slope; risk assessment; attribute recognition; geological hazard monitoring

1. Introduction

With the rapid increase of infrastructure investment, a large number of heavy haul railways have been built in Loess Plateau - the second step in China. Due to the influence of geological conditions and environmental factors, especially the gravity and weathering force, earthquake, precipitation and train load, subgrade settlement and local block invasion occurred in heavy haul railway cutting slope, even lead to landslide hazard. The disaster above would affect traffic safety and destroy railway infrastructure, causing serious property losses and personnel casualties. Therefore, it is necessary to carry out an in-depth study on the stability of the heavy load railway cutting slope (Qian and Rong 2008).

Among the existing research methods, the risk assessment of cutting slope considering the influence of multiple factors gained more and more attention (Li and Li 2002). Risk assessment is

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Acknowledgements

This work was supported by the National Natural Science Foundation of China (51609138) and (51608336), natural science foundation of Hebei Province (E2017210147) and Collaborative Innovation Center for Disaster Prevention & Mitigation of large basic infrastructure in Hebei Province. Great appreciation goes to the editorial board and the reviewers of this paper.

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