# Postprint: A Surrounding Rock Classification Method for Tunnel Construction Based on the Entropy Weight Method

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## Abstract

To address the issue of inevitable subjective factors in determining surrounding rock index parameters using existing rock mass classification methods, six parameters were comprehensively selected as evaluation indicators for tunnel surrounding rock classification based on a review of various rock mass classification methods: uniaxial saturated compressive strength of rock, rock integrity coefficient, volumetric joint count of rock mass, groundwater, Rock Quality Designation (ROD), and elastic longitudinal wave velocity of surrounding rock. The surrounding rock classification was performed using mathematical analytical methods based on entropy weight-extension matter-element theory and entropy weight-cloud model, and the rationality and accuracy were verified using the surrounding rock classification results from the design and construction stages of the Longnan Tunnel of the Ganzhou-Shenzhen High-speed Railway, which is currently under construction. The results indicate that using the entropy weight method to calculate the weight coefficients of evaluation indicators can overcome the subjectivity in determining weight coefficients and avoid human interference. These two rock mass classification methods represent a new exploration in tunnel surrounding rock classification, which is conducive to the development of rock mass classification towards intelligence-based and information-based directions.

## Full Text

### Surrounding Rock Classification Method for Tunnel Construction Based on Entropy Weight Method

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**Abstract**

To address the problem of subjective factors inherent in existing surrounding rock classification methods when determining evaluation index parameters, this study comprehensively selected six parameters as evaluation indices for tunnel surrounding rock classification based on a summary of various classification methods: rock uniaxial saturated compressive strength, rock integrity coefficient, rock mass volumetric joint count, groundwater conditions, Rock Quality Designation (RQD), and elastic longitudinal wave velocity of surrounding rock. The surrounding rock was classified using mathematical analysis methods based on entropy weight-extension matter-element theory and entropy weight-cloud model. The rationality and accuracy of these methods were verified using classification results from the design and construction stages of the Longnan Tunnel on the Ganzhou-Shenzhen high-speed railway currently under construction. The results demonstrate that using the entropy weight method to calculate the weight coefficients of evaluation indices can effectively overcome the subjectivity in weight determination and avoid human interference. These two surrounding rock classification methods represent a novel exploration in tunnel surrounding rock classification and are conducive to advancing the field toward intelligent and information-based development.

**Keywords:** tunnel engineering; surrounding rock classification; entropy weight method; extension matter-element theory; cloud model

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