

Experimental study of strength characteristics of reinforced broken rock mass

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Abstract: As the structure of broken rock mass is complex, with obvious discontinuity and anisotropy, it is generally necessary to reinforce broken rock mass using grouting in underground construction. The purpose of this study is to experimentally investigate the mechanical properties of broken rock mass after grouting reinforcement with consideration of the characteristics of broken rock mass (i.e., degree of fragmentation and shape) and a range of reinforcement methods such as relative strength ratio between the broken rock mass and cement-based grout stone body (λ), and volumetric block proportion (VBP) representing the volumetric ratio of broken rock mass and the overall cement grout-broken rock mass mixture after the reinforcement. The experimental results show that the strength and deformation of the reinforced broken rock mass is largely determined by relative strength ratio (λ) and VBP. In addition, the enhancement in compressive strength by grouting is more obvious for broken rock mass with spherical shape under a relatively high strength ratio (e.g., $\lambda=2.0$), whereas the shape of rock mass has little influence when the strength ratio is low (e.g., $\lambda=0.1$). Importantly, the results indicate that columnar splitting failure and inclined shear failure are two typical failure modes of broken rock mass with grouting reinforcement.

Keywords: broken rock mass; compressive strength; degree of fragment; failure modes; grouting reinforcement; volumetric block proportion