

Numerical Study on Mechanical Characteristic of Hydraulic Tunnel Across Fault Zone

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Abstract. In the process of excavation of hydraulic tunnels across the fault zone, the surrounding rock often lose steady and collapse, which will threaten the personal security. In this paper, a 3D model was established according to Hami pumped storage power station in Xinjiang. The variation of surrounding rock stress, deformation and plastic zone under the condition of full section excavation without support and timely support after excavation are compares and analysis. The calculated results indicate that the initial ground stress decreases along the axis of the tunnel in fault zone. In the case of excavation without support, the stress of surrounding rock in the fault zone will be released completely. The maximum deformation of tunnel vault along the axis is located in the left affected zone. In the case of timely support after excavation, the stress of surrounding rock in the fault zone will be partially retained. The deformation of tunnel vault is much smaller than that without support after excavation and the upper part of tunnel in fault zone basically has no plastic failure.

Keywords. Hydraulic tunnel, fault zone, mechanical characteristic

1. Introduction

Fault zone is a zone which consisting of a main fault plane and its two sides of fractured rocks as well as several secondary faults or rupture planes. The shear displacement in the narrow zone on both sides of the fault zone has great damage to the underground structure, such as hydraulic or highway tunnel. The investigation shows that geological disasters often occurred in the tunnel construction and operation [1-3], which will cause great difficulties to the construction and subsequent maintenance, and may even threaten the personal security [4].

In the construction process of a hydraulic tunnel, it will often unavoidable encounter the fault zone, so it is necessary to develop appropriate excavation method and scientific and reasonable support measures to ensure the safety of tunnel [5-7]. Although there have been many studies on hydraulic tunnels crossing fault zone [8-9],

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