岩石力学与工程学报 2005 24 (16): 2982 ISSN: 1000-6915 CN: 42-1397/O3

深埋特长公路隧道岩爆预测综合研究

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收稿日期 2004-8-13 修回日期 2004-12-8 网络版发布日期 2007-2-14 接受日期 2004-8-13

摘要 岩爆预测一直是地下工程世界性难题之一。以台缙高速公路苍岭隧道的岩爆预测为例，从隧道区围岩的岩体特征和隧道区初始应力场两方面着手，通过工程地质调查研究和区域地质资料分析，对隧道区进行工程地质分类。划分隧道沿线各洞段隧道围岩类别，通过室内岩石力学试验，掌握隧道沿线围岩的物理力学特性；分析区域地震震源机制解、地应力实测资料，揭示区域构造地应力场环境。在研究过程中选取典型部位，采用水压致裂法实测工程区地应力的大小和方向。通过三维有限元反演工程区的初始应力场，在初始应力场和隧道围岩岩石力学性质研究的基础上，结合各洞段隧道断面开挖数值分析结果和现有国内外多种岩爆判别准则，对苍岭隧道岩爆发生的部位和等级进行预测，为制定合理的开挖支护方案提供依据。

关键词 隧道工程；岩爆；地应力；数值模拟

分类号

COMPREHENSIVE STUDY ON PREDICTION OF ROCKBURST IN DEEP AND OVER-LENGTH HIGHWAY TUNNEL

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Abstract

Cangling tunnel in Taizhou¾Jinyun highway，with a depth about 768 m and with a length about 7.6 km，will be the deepest and longest tunnel in Zhejiang Province after construction. Rockburst is a serious problem during the tunnel excavation. For the prediction of rockburst，physico-mechanical properties of the rock masses were tested in the laboratory；and the in-situ stress state in the engineering area was measured and analyzed. Then，the rock masses along the tunnel were classified on the basis of local geological investigation. A mechanical model was developed to express the actual conditions of the engineering area according to properties of the rock masses，focal mechanism solutions，and in-situ stress state. The in-situ stress field of the engineering area was regressed by 3D finite element method (FEM) by using in-situ measured stress. The calculated results were applied to numerical analysis of the stress distribution in rock masses around the tunnel. Finally，the probability and intensity of rockburst along tunnel were predicted according to four different rockburst prediction models developed by predecessors on the basis of calculated stress distribution around the tunnel and uniaxial compressive strength of the rock masses.

Key words tunneling engineering；rockburst；in-situ stress；numerical simulation

DOI:

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