

Numerical Study on Mechanical Characteristic of Hydraulic Tunnel Across Fault Zone

Xubin HUANG ^{a,1}, Xiaomin LI ^b, Shengjie DI ^a, XI Lu ^a, Zhe MIAO ^a, Ying ZHANG ^a, Peng HUANG ^a and Kai ZHANG ^c

^a Northwest Engineering Corporation Limited, Power China, Xi'an, Shanxi, 710065, China

^b Xi'an SiYuan University, Shaanxi, Xi'an 710038, China, 83790957@qq.com

^c Hohai University, Jiangsu, Nanjing 210098, China

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],

¹ Xubin Huang, Corresponding author, Northwest Engineering Corporation Limited, Power China, Xi'an, Shanxi, 710065, China; E-mail: huangxb@nwh.cn.

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Studies On The Mechanical Characteristic:

Frontier Research on High Performance Concrete and Mechanical Properties Ping Xiang,Haifeng Yang,Jianwei Yan,2024-11-25 This open access book focuses on cutting edge research in high performance concrete Concrete has been a main construction material all over the world in the past century As the demand for construction rises the need for concrete with stronger performance grows as well Existing studies on high performance concrete are mainly on fiber admixtures and reactive mineral powder admixtures with a focus on concrete proportioning and rheological properties Through in depth analysis of real world engineering cases and demonstration of the latest research achievements this book aims to provide a systematic review of research on high performance concrete for civil engineers and scholars in related research fields The topics of this book include but are not limited to the following 1 Fiber Reinforced Concrete and Admixture Factors 2 Effect of Mineral Reactive Powders on Concrete 3 High Performance Concrete Packing Density and Rheological Properties 4 High Performance Concrete Proportioning and Theoretical Research 5 Research on Mechanical Properties of High Performance Concrete

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The Mechanical Properties of Sea Ice W. F. Weeks,Assur, Andrew,1967 The review discusses the state of thinking of each of the main national groups investigating sea ice and gives an overall appraisal of the field as a whole Emphasis is placed on 1 the physical basis for interpreting sea ice strength phase relations air volume and structural considerations 2 theoretical considerations strength models air bubbles and salt reinforcement and interrelations between growth conditions and strength 3 experimental results tensile flexural shear and compressive strength elastic modulus shear modulus and Poisson s ratio time dependent effects and creep and 4 plate characteristics The paper includes a review of problems in sea ice investigations relates the chemical crystallographic mechanical and physical aspects involved and

concludes by showing how to utilize this knowledge to solve practical problems Author **Mechanical Properties of Natural Fiber Reinforced Polymers: Emerging Research and Opportunities** Gebai, Sarah S.,Hallal, Ali M.,Hammoud, Mohammad S.,2018-01-30 The huge consumption of earth s natural resources and the reliance on industrial manufactured products have produced significant impacts on the environment As such new strategies must be adopted in order to support the protection and continued development of numerous natural resources Mechanical Properties of Natural Fiber Reinforced Polymers Emerging Research and Opportunities is a critical scholarly resource that examines green energy sources and material enhancements that will help to solve ecological problems Featuring coverage on a broad range of topics such as harvesting techniques origins of natural fibers and modeling for textile composites this book is geared towards engineers researchers scholars and graduate students in the fields of materials science and engineering **Nuclear Science Abstracts** ,1963 **Mechanical Properties and Structure of Alpha-keratin Fibres** Max Feughelman,1997 The mechanical properties of wool hair and other alpha keratin fibres represent the most important physical properties for which these fibres are used whether this be in the manufacture of textile garments reshaping human hair or in the alignment of fibres in paint brushes [The Laser Manufacturing Process](#) Anooshiravan Farshidianfar,Seyedeh Fatemeh Nabavi,Mohammad Hossein Farshidianfar,2024-08-21 The Laser Manufacturing Process is a comprehensive guide to industrial laser processes offering insights into their fundamentals applications across industries production specifics and characteristics including mechanical metallurgical and geometrical aspects as well as potential defects The book also investigates how industrial laser processes are developed and the diverse attributes of the resulting objects emphasizing their significance in industrial settings Here objects refer to the tangible outcomes of laser manufacturing encompassing a wide array of products and components created through processes like cutting welding and additive manufacturing These objects exhibit distinct mechanical properties metallurgical characteristics and geometrical precision all of which are crucial considerations in their utility and performance within industrial environments This book functions as a concise reference manual catering to the needs of both students and professionals who require knowledge related to laser manufacturing processes such as laser cutting laser welding and laser additive manufacturing processes **Mechanical Properties of Polymers Measured through AFM Force-Distance Curves** Brunero Cappella,2016-07-14 This Springer Laboratory volume is a practical guide for scientists and students dealing with the measurement of mechanical properties of polymers at the nanoscale through AFM force distance curves In the first part of the book the reader will find a theoretical introduction about atomic force microscopy focused on force distance curves and mechanical properties of polymers The discussion of several practical issues concerning the acquisition and the interpretation of force distance curves will help scientists starting to employ this technique The second part of the book deals with the practical measurement of mechanical properties of polymers by means of AFM force distance curves Several hands on examples are illustrated in a very detailed manner with

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