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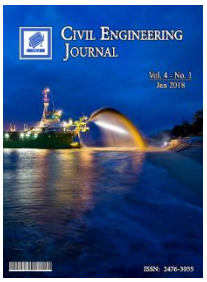

Stability Analysis and Support Design of Imam Reza Tunnel in Ardabil Sarcham Road by Numerical Methods

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Abstract

Geological structures and performance of the geodynamic processes can affect engineering projects on their own. Hence, the stability analysis and designing methods for foreseeing the retaining and support system for tunnels are diverse and came from different points of view. So this study seeks to present stability analysis of Imam Reza tunnel in Ardabil Sarcham Road with a special focus on the impact of future earthquakes on its stability using numerical methods. In this study, first designing and operating the initial structure with the height of 5.5 m and a semi-circular cross section. Secondly, drilling with the height of 3m and the width of 7.34 m and with a rectangle cross section. For stabilization, Rock Mass Rating (RMR) geomechanical classification systems and methods used. At the stabilization level, the materials were examined in laboratory, regarding the properties of sides and roof of the tunnel and pressure on them. The results of physical and mechanical experiments shown that the compressive strength ranged from 400 kg/cm^2 to 500 kg/cm^2 on average. The elastic modulus is between 12 and 13 GPa for the rocks. The Cohesion (C) ranged from 4-5MPa to 5 MPa and the Angle of Internal Friction (φ) is between 60^o and 50^o.

Keywords: Performance-Based Seismic Engineering; Seismic Coefficients; Concrete Special Moment Frames; Endurance Time Method.

1. Introduction

The tunnel industry considered that tunnels were naturally resistant to earthquake action for many years, as they did not experience the same high levels of shaking as surface structures. This perception was supported by the relative good historic performance of tunnels and underground structures, especially of tunnels in rock, during large earthquakes [1].

One of the most significant current discussions in tunneling is stability. In recent decade, numerical modeling has been introduced to check the stability. When the tunnel has been made, stability is an important factor due to advancing cycle and cost especially in soil or weak rock [2].

One of the most important factors for designing a tunnel or other underground spaces is to provide the stability. Due to the fact that boring a tunnel requires relatively high costs, any mistake in studying, analyzing, and operating the support systems as well as utilizing them improperly, leads to wasted capital and furthermore, it prevents us from reaching our goals. Regarding these explanations, it's necessary to suggest a single or mixed support system through a complete analysis of different geological and geomechanical parameters so that it will get the highest efficiency with the lowest cost. Full check of the properties of rock mass and its situation is one of the crucial issues of reaching this purpose.

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