



Effect of Interface Condition on Lining Structural Performance in Tunnels Support

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Abstract

With respect to the frictional performance of the 3D panels studied in this research, the tunnel wall friction plays an important role in distribution of internal forces and consequently optimum design of tunnel support system, hence, the main objective in this study is achieving the appropriate range of the wall friction and based on this range, determining the most accommodating soil type. In this article the tunnel cross section has been assumed as a reinforced concrete, and also it is assumed that the soil cohesion has no effect on the analysis. In the both static and dynamic condition, for different values of tangential spring stiffnesses, analysis of the tunnel structure, using SAP 2000 software, was carried out and by means of interaction diagram, optimal range of wall friction ascertained. As a consequence of this study, in the static analysis more wall friction prefers whereas having less wall friction, in the dynamic analysis, is better.

Keywords: Interface condition, Tangential spring, Frictional performance, lining Performance, Wall friction

1. INTRODUCTION

In recent years considerable advances has been made in order to move away from traditional support using heavy rolled steel arcs (ribs) in tunnel supports to lighter, more manageable lattice girders, steel mesh and steel fibers providing a continuous support.

In the implementation of tunnel primary supports for acceleration and facilitation of installation of the supports, 3D panels such as lattice girders are able to switch load directly to the bearing member without requirement of shotcrete. The structural mechanism of this system is based on friction with tunnel walls, so it is possible to optimize utilizing of these systems by means of modification of the host ground characterization for achievement to the optimum friction. Optimum friction of tunnel walls is related to various factors such as loading conditions, tunnel profile, cross section span and etc. In this research procedures of achieving the optimum range of wall friction for a tunnel with Arch profile and the most accommodating host ground under static and dynamic loading condition have been presented.

2. GROUND-STRUCTURE INTERACTION MODELING

Generally, the soil support is divided into a radial and a tangential soil support. (Figure 1)[1]

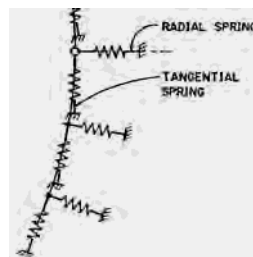


Figure 1. Radial and tangential elastic supports