

# Effects of Open-cut Tunnel with Large Cross Section in Sandy Cobble Ground on Pile Foundations of Adjacent Existing Viaducts

Junfu LU<sup>1, 2, \*</sup>, Peng JIAN<sup>1</sup>

<sup>1</sup>State Key Laboratory of Geohazard Prevention and Geoenvironment Protection, Chengdu University of Technology, Chengdu, 610059, China;

<sup>2</sup>China Railway Eryuan Engineering Group Co. Ltd, Chengdu, 610031, China.

**Abstract:** This research is based on the design and construction plan of open-cut tunnel for an underpass with large cross-section in sandy cobble ground of Chengdu, Sichuan Province, in china. By means of finite difference method for three-dimensional (3D) model calculation, we analyze the variation laws of displacement and internal force of adjacent pile foundations in the process of open-cut tunnel construction. As a result, we propose an open-cut construction process suitable for this type of engineering condition. The results for the research are shown as follows: after the completion of foundation pit excavation, ground settlement was caused mainly within a radius of 32 m around the pit edge with all the settlement above 10mm; when the excavation was operated over a depth of 60%, significant difference emerged in settlement of each pile foundation, with a bigger change in the displacement of ramp piles and the right piles at a distance of 6.5m from the foundation pit; the maximum horizontal displacement of piles was about half of their length with slight bending in the pile body and tendency for the right and left piles to incline towards the foundation pit; the piles far away from the foundation pit had relatively bigger bending moment and axial force with the inflection point at the 2/3 of the pile length and all the safety factors of the pile foundations above 2.0, which was consistent with relevant provisions; after the completion of foundation pit excavation, the horizontal support axial force in the middle of the foundation pit was the greatest, requiring special treatment. Therefore, relevant measures should be taken before open-cut construction begins so as to ensure safety of adjacent piles. This research offers reference to the design and construction of similar tunnels.

**Keywords:** Sandy cobble ground, High-speed rail tunnel, open cut, mechanical properties