

عنوان مقاله:

Physical modeling of soil arching around shallow tunnels in sandy grounds

محل انتشار:

مجله بین المللی معدن و مهندسی زمین, دوره 56, شماره 4 (سال: 1401)

تعداد صفحات اصل مقاله: 10

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خلاصه مقاله:

The distribution of earth pressure surrounding a tunnel is one of the most critical factors in designing tunnel support systems. In this study, a physical modeling setup has been designed and constructed to simulate the excavation procedure of a full-face circular tunnel. Silica sand was used with four different densities and three different cover-to-tunnel diameter ratios. The full-face excavation was simulated with a variation of tunneling-induced volume loss. The variations of earth pressure around the tunnel were measured by means of a series of miniature soil pressure cells. Particle Image Velocimetry (PIV), as a non-destructive image processing technique, was used to monitor the deformation of the soil surrounding the tunnel. The results obtained from both pressure cells and PIV showed that soil arching developed around the tunnel. As tunnel convergence increased, a loosened zone appeared above the tunnel, surrounded by a stress arch. It was discovered that there is a direct relationship between the height of the loosened zone and the depth of the tunnel. A linear equation has been established for the estimation of the height of the loosened zone, which has a direct influence on the design of the support system.

کلمات کلیدی:

(Tunneling, Physical model, Soil arching, Particle Image Velocimetry (PIV

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