

## Soil-Structure Interaction of Tunnels in Soft Clay Soil

*elsamany mk, mohamed Abdel Razik, Mustafa Kotb, Mohamed Gouda*

### Abstract

The construction and use of tunnels can be considered one of the most important features of civilization in developed nations. But, it is very difficult to construct tunnels in soft clay soil. So, the objectives of the present study are: i) identify the most suitable shape [Circular, Elliptical and Rectangular with Arch Circular (like horseshoe)] tunnels in soft clay soil. ii) The effect of change shape of tunnels [circular, elliptical and rectangular with arch circular (like horseshoe)] on the internal forces in the tunnel and the internal stresses as well as settlement in soft clay soil. In the present study, a numerical analysis using finite element software ADINA version 8.5 (a finite element computer program) was used. A numerical model was presented as a plane strain problem. The Mohr-Coulomb model was used to simulate the non linear soft clay soil with different modulus of elasticity ( $E_s$ ) 1000, 1500 and 1900 kN/m<sup>2</sup>, different Poisson's ratio ( $\mu_s$ ) 0.4, 0.45 and 0.49, and ( $t/r$ ) of (0.1, 0.15, 0.2). The analysis showed that the circular shape for tunnels is the most suitable shape in soft clay soil. As the internal forces and the vertical displacement as well as the horizontal stresses for the lining of circular tunnels is less than for the two adjacent elliptical as well as rectangular with arch circular (like horseshoe) tunnels. As the internal forces decreased up to 75%, the horizontal stresses increased to 35% and the shear stresses decreased to 70%, as well as the displacement decreased to 70% at some cases.