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## Study on Deformation and Force Characteristics of Deep-buried Large Section Expansive Red Clay Tunnel

**Zhuowu Xie** and Xiyong Wu

Southwest Jiaotong University, Faculty of Geosciences and Environmental Engineering, Geological engineering, China (xie9204@126.com)

Due to the large burial depth of the Pliocene Red Layer in Qingyang, Gansu and its special historical causes, its engineering mechanical characteristics are quite different from those of the southern red clay. Lack of systematic data on the internal forces of the lining structure through the stratum tunnel. Therefore, this paper takes the Yinchuan-Xian High-speed Railway Qingyang Tunnel as the research object, through field measurement and finite element simulation to obtain the space-time distribution characteristics of the internal force of the lining structure, the surrounding rock pressure, the deep displacement of the surrounding rock from 5 to 10 m, and the convergent deformation of the support. The reasons for the stress state of the lining-surrounding rock composite structure reflected in the results are analyzed, and the ABAQUS software is used to simulate the tunnel excavation process to compare and verify the lining structure stressing law. Internal force characteristics. The results show that: 1) The physical and mechanical indicators of the Pliocene red layer in the Neogene in Qingyang, Gansu belong to the extremely hard soil-very soft rock critical category. Due to the long consolidation pressure and long consolidation history, it can be obvious on the saturated flooding fault surface. Observation of the characteristics of layered joints proves that this layer of red clay has a tendency of sedimentary diagenesis. 2) The quality of the surrounding rock of the stratum lining structure is good. The horizontal in-situ stress is twice that of the vertical in-situ stress. It can be optimized for the design of III-IV surrounding rock while increasing the side pressure coefficient. 3) The unclosed initial support cannot effectively limit the deformation of the surrounding rock, and the temporary stress can be used to improve the state of stress. The numerical simulation results are consistent with the field measurement laws. 4) This stratum with severe deformation is the cave diameter range of the excavation boundary to the surrounding rock. The deformation area is mainly concentrated in the vault. Delayed excavation of the inverted arch can effectively reduce the stress on the internal lining structure of the inverted arch.