



Analysis of Deformation and Failure Mechanism of Rock Slope with Weak Intercalation Induced by Excavation

LI Liangliang¹ and ZHU Dapeng^{1,2*}

¹ Southwest Petroleum University, Cheng'du 610500, Sichuan, China

² Key Laboratory of Disaster Prevention and Mitigation, Hubei Province (China Three Gorges University), Yichuang 443002, Hubei, China

Citation: Li et al., 2019. Analysis of Deformation and Failure Mechanism of Rock Slope with Weak Intercalation Induced by Excavation. *Acta Geologica Sinica* (English Edition), 93(supp.2): 354–355.

Abstract: Due to the undulation of landform, the development of tectonic activity and the complexity of stratum and lithology in southwest China, it is easy to cause landslide geological disaster during human engineering excavation. Therefore, taking excavation slope of liluo expressway in guizhou province as an example, It is necessary to analyze the deformation and failure mechanism of rock slope with weak intercalation induced by excavation. The top-to-bottom rock and soil composition is as follows: (1) overburden: clay, yellow, hard plastic, poor plasticity, wet, about 2m thick; (2) strong weathering layer: yellowish, thinly layered, with well developed fractures, broken rock mass, soft rock, about 30m thick; (3) weak intercalation: located in the middle and upper part of the strong weathering layer, yellowish, brecciated mudstone, about 1m thick. (4) middle weathering layer: gray, well-developed fractures, relatively complete rock mass and soft rock. Through the numerical modeling of 3DEC, as shown in figure 1, the monitoring points are set to observe the displacement change of rock and soil mass. The positions are as follows: back slope (id=2), overburden (id=3), the first excavation foot (id=4), the second excavation foot (id=5), the weak intercalation outcrop (id=6), the third excavation foot (id=7), the fourth excavation foot (id=8). The rock mass of cataclastic structure contains many

joints and fissures with poor bond, which is argillaceous cement, poor cohesion and tensile strength, and contains a weak intercalation. Under the influence of excavation, along with unloading rebound, stress is transferred to the back slope along the joints and weak intercalation. With the deepening of excavation, it will appear local landslides. The potential slip surface will penetrate along the joint crack and the weak intercalation gradually, and shear out from the excavation slope foot and the weak intercalation, finally, the tension crack will appear behind and on both sides of the slope. Fig. 2 shows the displacement deformation of rock and soil mass and the deformations of monitoring point are shown in fig. 3. The results show that the relationship between excavation and displacement and deformation of rock and soil is approximately step linear, which is basically consistent with the trend of actual displacement and deformation. It is proved that the numerical simulation is effective and practical to reveal the deformation and failure of slope. This study can be applied to the prediction of landslide geological hazards and other fields.

Key words: rock slope, weak intercalation, excavate, 3DEC

Acknowledgments: This work is granted by financial support of the National Natural Science Foundation of China (41302256) and the Open Fund of the Key Laboratory of Hubei Province for Disaster Prevention and Mitigation (2016KJZ04).

Reference

- Qiu, J.L., Wang, X.L., He, S.Y., Liu, H.Q., Lai, J.X., and Wang, L.X., 2017. The catastrophic landslide in Maoxian County, Sichuan, SW China, on June 24, 2017. *Natural Hazards*, 89 (3): 1485–1493.
- Zhu, D.P., Yan, E., Dong, S., and Huang, L., 2013. Real-time Response of Yuhuangge Landslide on the Reservoir Water Fluctuations in the Three Gorges Reservoir Area and Inversion on its Permeability Coefficient. *Disaster Advances*, 6(7): 26–33.
- Zhu, D.P., Yan, E.C., Huang, L., and He, Q.D., 2012. Action Mode of Groundwater on Landslide Mass and Standard Variation Curve of Landslide Stability with rise of Reservoir Water. *Disaster Advances*, 5(4): 721–725.

About the first author

LI Liangliang, male, born in 1993 in Dazhou City, Sichuan Province; master; He is now studying on Geological engineering specialty at Southwest Petroleum University. Email: 907171547@qq.com ; phone: 17361012889.

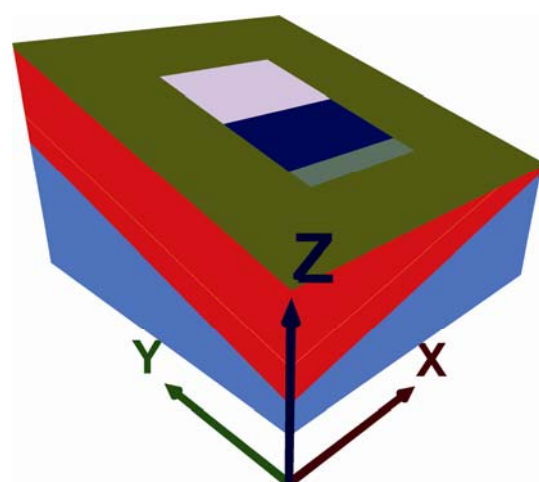


Fig. 1. 3dec model

* Corresponding author. E-mail: zdpug@126.com

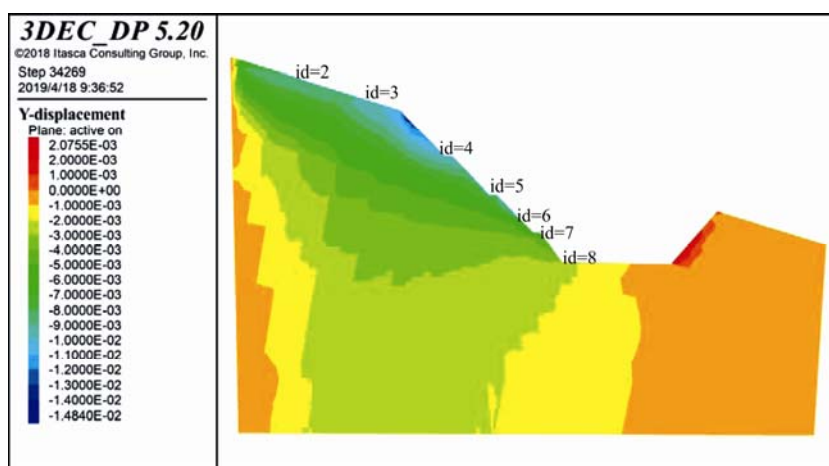


Fig. 2. Profile displacement deformation.

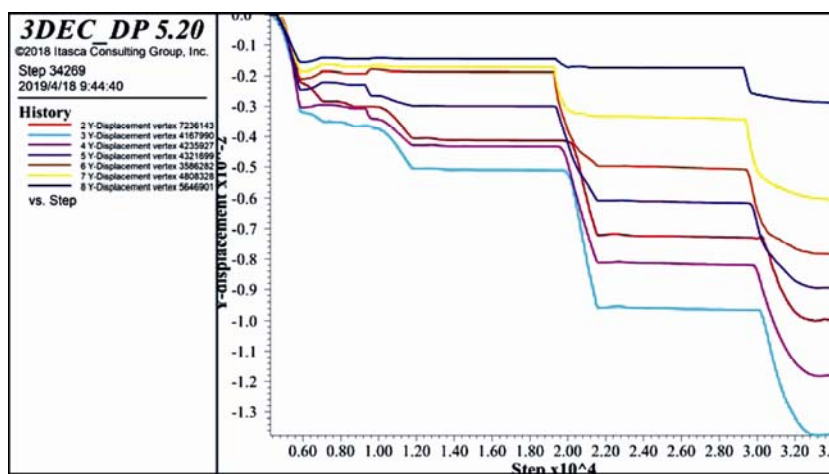


Fig. 3. Monitoring point excavation displacement change.

About the corresponding author

ZHU Dapeng, male, born in 1981 in Hubei Province; Doctor, associate professor; He is now mainly engaged in the teaching and research of geological disaster prevention theory. Email: zdpug@126.com; phone: 13666287087.