

## **Using Discrete Element Method to Simulate Influence of Vertical Joints and Upward Groundwater on The Stability of Dip Slope: A Case Study on Formosa Freeway**

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Earthquake and rainfall weakening potential sliding surface are common causes of dip slope failure. But in recent years, certain dip slopes failure, for example dip slope sliding without rain on the roadside of Formosa Freeway in northern Taiwan, are caused by uplift groundwater in vertical joints eventually weakening the potential sliding surface. The mechanism of sliding failure should be analyzed in more detail. Furthermore, prestress dissipating in anchors causing dip slope failure is also considered in this study.

In this study, conceptual model is simplified from the case of Formosa Freeway in northern Taiwan and the main control factors including angle of slope, stratum, attitude of joints. In addition, drilling data, such as hydraulic conductivity, strength, friction angle and cohesion, are utilized to discuss mechanism and dominant factors of dip slope failure caused by uplift groundwater in vertical joints. UDEC(Universal Distinct Element Code) which is particularly well suited to problems involving jointed media and has been used extensively in stability analysis of jointed rock slopes is utilized in this study. The influence of external factors such as groundwater pressure on block sliding and deformation can also be simulated in UDEC. When the results from numerical simulation fit the condition of slope failure on the roadside of Formosa Freeway, the influence of prestress dissipating in anchors on slope stability is considered subsequently.

Finally, simulation results by UDEC are compared with previous research results by FLAC, and discuss the difference between each other.