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Formation Mechanism and Stability of a Gentle Dip Bedding Rock Slope: A case Study at Shimen Silica Mine, Liaoyang, China

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Abstract: The Shimen Silica Mine is located in Hanling town, Liaoyang city, northeast China. The Shimen landslide was caused by step open-pit mining. The obvious deformation phenomenon appeared in the step of the mine, and the situation is deteriorating continuously. Therefore, it is a serious threat to the surrounding constructions and the safe operation of the mine. The field investigation, mapping, geological borehole data, rock physical mechanics test, slip zone soil test and mineral composition test were applied to analyze the formation mechanism and stability of the landslide. In the field investigation, a detailed investigation was carried out on the steep dip ensile cracks and the gently inclined structure planes. In addition, the window sampling method was used to describe 443 traces in 7 windows for the random discontinuities. Combined with the geological borehole data, the rock mass structure of the landslide has four characteristics: 1) hard and thick gentle dip bedding rock slope; 2) soft and hard alternated structure; 3) the landslide area with rigid upper layer and soft lower layer; 4) layered block fracture slope. On the basis of investigation on the structural characteristics of the rock slope, the description and evaluation are given to the integrity degree of the rock mass and the quality level of the rock mass. Further analysis was made to determine the boundary conditions of the landslide. The failure mechanism of the landslide is mainly composed of two parts: compression cracking in the early stage and creep-sliding and fracturing in late stage. Geoslope software and the program written by our research team were used to analyze the safety factor of the landslide under different conditions.

