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Large scale field test on a filigree surface system combined with vegetation

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The stabilization of slopes with soil nailing is a subject of current research interest. There are numerous field tests on the stability of nailed slopes in the literature. However, most field tests deal with soil nails in combination with shotcrete as surface protection. Little is known about alternative surface cover other than shotcrete. Recently, systems of filigree surface support system combined with vegetation technique have gained considerable popularity. Some laboratory model tests have been carried out on such a surface support system. In the present paper, some results of a large scale field test on a filigree surface support are reported.

The filigree surface support system considered here is developed by Krismer, which has been used mainly as a surface protection measure in erosion control for about 20 years. In recent years, this surface support system together with vegetation is being frequently used as an alternative technique to stabilize steep slopes. This surface support system is dimensioned according to DIN 1045, where about 85% of the active earth pressure is used. This is common design practice in dimensioning shotcrete surface support and is reasonable for steep slopes with an inclination between 70˚ and 90˚. However, for slopes with an inclination less than 70˚, the main function of such a support system is to avoid shear failure along slip surface rather than retaining the earth mass. In such case, an alternative design approach should be adopted. Due to the distribution of stress throughout the length, the forces acting on the nail heads are lower than in case of anchor heads, which is an advantage over anchoring system.

In order to investigate the behaviour of filigree, a close-to-nature surface retaining system a large scale filed test is carried out. For this purpose, an embankment was constructed using the Krismer® system, instrumented and finally destroyed by increasing the surcharge. During the test, the forces on nails, nail heads, steel grids, earth pressure, loading on the embankment and displacements were measured and compared with designed values. Strain gauges were used to measure the elongations of nails. In addition, 3D laser scanner and digital camera were used to digitize the embankment slope and present it in 3D model.

This field test will represent a first step to develop the design criteria for the dimensioning of filigree surface retaining systems.