

Limit Analysis of Soil-Root Composites

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In this paper, the influence of root reinforcement on shallow soil protection has been studied by Finite Element (FE) method. Taking the root-soil composite as a periodic material, the homogenization method is used to model a Representative Volume Element (RVE) which consists of roots and soil. This RVE is discretized by a 2-D FE mesh, while special formulation is established, so that this 2-D mesh is capable of describing three-dimensional deformations when the strain field is invariant along the fiber axis. The important effect of de-bonding on the interface between the fiber and the matrix is also considered by using a special interface element. Three axial test was conducted, where the root-soil composite was subjected to the axial and lateral pressures. In the test, all samples contain more than 100 roots to assure the periodic condition. Good agreement of limit loads has been achieved between the numerical and the experimental results.

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