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The use of soil-root interaction for slope stabilization

R. Katzenbach

Technische Universität Darmstadt, Institute and Laboratory of Geotechnics, Petersenstraße 13, D-64287 Darmstadt, Germany (katzenbach@geotechnik.tu-darmstadt.de)

It is well understood that vegetation influences slope stability in following ways: (1) By mechanical reinforcement from the plant roots; (2) by increasing in soil suction or reduction of pore water pres-sure, hence, an increase in the soil shear strength, through the removal of soil water by evaporation through vegetation; (3) by surcharge from the weight of trees; and (4) by "wind throwing" or root wedging". There exist different kinds of vegetation, i.e. grass, shrubs and trees with different contributions to soil stability and different properties in root tensile and shear strength, rooting depth and root morphology. The scope of this paper is to perform the differences considering the references found in literature and own investigations. For example for the stability analysis of natural slopes it is essential to know the depth of the root zone, which is quite difficult to determine. The roots of shrubs extend to 0.5-1.0 m below slope sur-face and herby they play an important role in stabilizing shallow-seated failure of slopes. Tree roots can spread out for considerable distances. The extent of root spread is normally reported in relative multiples of the tree height or crown radius. The hydraulic influence of a tree, that is, significant soil moisture, reductions by evaporation, can be felt to a distance of at least one times the tree height. The additional strength provided by roots to the soil is generally considered to be in the form of a cohesion which may range in magnitude about 1 kN/m^2 to 20 kN/m^2. The strength of a root-permeated soil can be expressed e.g. by a modified Mohr-Coulomb model. Other researchers identified on grass-soil systems that root permeated soil has an influence on both parameters and therefore the shear strength can only be mentioned as an integral value. Studies on the tensile strength of tree roots show that small roots sampled from living trees range in tensile strength from about 10 MN/m^2 to about 70 MN/m^2. Furthermore this paper presents first results of field studies which were carried out using our large new designed shear box apparatus to identify soil-root parameters of shrubs and birch and maple saplings. Completing different methods of slope stability

analysis considering the soil-root interaction to pro-vide the index of stability or factor of safety are presented.