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Surface Configurations in Anchored Geosynthetic Systems (AGS)

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ABSTRACT

Coastal landforms are mainly composed of sandy, largely cohesionless materials that are vulnerable to both surficial and mass erosion subjected to destabilizing forces by wind, wave, and seeping water. These slopes may undergo surface particle instability even if they are stable against mass sliding failure. An important reinforcing role of Anchored Geosynthetic Systems (AGS) in this case will be to provide some confining pressure at the surface and keep soil particles in place and capable of resisting tractive forces exerted by the flowing or emerging water. The analysis shows that the normal stress beneath the fabric is a function of the ground or fabric curvature. This induced normal stress at the soil-fabric interface will increase the stability of soil particles against surficial erosion. The generated resultant of normal and shear stresses beneath the fabric is not, in general, uniform since it is a function of the fabric configuration. While this discrepancy does not significantly influence the mass stability of a slope due to the Boussinesq's stress distribution effect with depth, it could be important with respect to surface particle stability. The presented study analyzes the appropriate shape for AGS segments such that the stress fields under all segments will be identical and uniform when equal anchorage loads are applied by all row anchors. The numerical solutions show that the tension in the fabric decreases as amplitudes of curves become larger and the shapes change from approximately circular arcs to rotated elliptical arcs. The case of non-uniform stress distribution beneath the fabric is also considered and presented. Accordingly, a circular arc with a relatively small amplitude appears to be an appropriate and practical choice for the ground surface shape in AGS field applications. This shape can induce a fairly uniform stress distribution beneath the fabric between two anchor rows if anchors are driven at an orientation approximately equal to the interface friction angle between soil and fabric. The expression for the induced normal stress under this condition is also presented.

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